User's Manual

YTA Series

YTA Series Temperature Transmitter Fieldbus Communication

IM 01C50T02-01E

vigilantplant®

YOKOGAWA
Yokogawa Electric Corporation

IM 01C50T02-01E
8th Edition

YTA series
Temperature Transmitter Fieldbus Communication

IM 01C50T02-01E 8th Edition

CONTENTS

1. Introduction 1-1
   - ■ Regarding This Manual 1-1
   - ■ For Safe Use of Product 1-2
   - ■ Warranty 1-2
   - ■ ATEX Documentation 1-3
2. Part Names 2-1
3. About Fieldbus 3-1
   - 3.1 Outline 3-1
   - 3.2 Internal Structure of YTA 3-1
     - 3.2.1 System/network Management VFD 3-1
     - 3.2.2 Function Block VFD 3-1
   - 3.3 Logical Structure of Each Block 3-1
   - 3.4 Wiring System Configuration 3-2
4. Getting Started 4-1
   - 4.1 Connection of Devices 4-1
   - 4.2 Host Setting 4-2
   - 4.3 Bus Power ON 4-2
   - 4.4 Integration of DD 4-3
   - 4.5 Reading the Parameters 4-3
   - 4.6 Continuous Record of Values 4-3
   - 4.7 Generation of Alarm 4-3
5. Configuration 5-1
   - 5.1 Network Design 5-1
   - 5.2 Network Definition 5-2
   - 5.3 Definition of Combining Function Blocks 5-3
   - 5.4 Setting of Tags and Addresses 5-4
   - 5.5 Communication Setting 5-4
     - 5.5.1 VCR Setting 5-4
     - 5.5.2 Function Block Execution Control 5-5
   - 5.6 Block Setting 5-6
     - 5.6.1 Link Object 5-6
     - 5.6.2 Trend Object 5-6
     - 5.6.3 View Object 5-7

All Rights Reserved, Copyright © 2000, Yokogawa Electric Corporation

5.6.4 Parameters of Transducer Block 5-12
5.6.5 Parameters of AI Function Block 5-14
5.6.6 Parameters of DI Function Block 5-15
5.6.7 A setting when Sensor input 2 is not connected 5-15
6. In-process Operation 6-1
6.1 Mode Transition 6-1
6.2 Generation of Alarm 6-1
6.2.1 Indication of Alarm 6-1
6.2.2 Alarms and Events 6-1
6.3 Simulation Function 6-2
6.4 Operation of Integral Indicator 6-2
7. Errors and Warnings 7-1
7.1 Error and Warning Indications 7-1
7.2 Checking with LCD 7-1
7.3 Checking with DEVICE_STATUS_1 to _8 of Resource Block 7-5
7.4 Precautions on Warnings 7-8
8. Handling Caution 8-1
8.1 Installation of Explosionproof Type Transmitters 8-1
8.1.1 CSA Certification 8-1
8.1.2 ATEX Certification 8-2
8.1.3 FM Certification 8-7
8.1.4 IECEx Certification 8-10
9. General Specifications 9-1
9.1 Standard Specifications 9-1
9.2 Optional Specifications 9-2
Appendix 1. List of Parameters for Each Block of the YTA A1-1
A1.1 Resource Block A1-1
A1.2 AI Function Block A1-3
A1.3 DI Function Block A1-5
A1.4 Transducer Block A1-7
A1.5 Unit and Code A1-12
Appendix 2. Parameters for Basic Settings, and How to Make and Change the Settings A2-1
A2.1 Basic Settings and Corresponding Parameters A2-1
A2.2 Making and Changing Basic Parameter Settings A2-2
A2.3 Setting Up the Transducer Block A2-2
A2.4 Setting Up AI Blocks A2-5
A2.5 Setting Up DI Blocks A2-6
Appendix 3. Function Block Diagram A3-1
A3.1 AI Block Function Diagram A3-1
A3.2 DI Block Function Diagram A3-1

Appendix 4. PID Block A4-1

A4.1 Function Diagram A4-1

A4.2 Functions of PID Block A4-1

A4.3 Parameters of PID Block A4-2

A4.4 PID Computation Details A4-4

A4.4.1 PV-proportional and -derivative Type PID (I-PD) Control Algorithm A4-4

A4.4.2 PID Control Parameters A4-4

A4.5 Control Output A4-4

A4.5.1 Velocity Type Output Action A4-5

A4.6 Direction of Control Action A4-5

A4.7 Control Action Bypass A4-5

A4.8 Feed-forward A4-5

A4.9 Block Modes A4-5

A4.9.1 Mode Transitions A4-6

A4.10 Bumpless Transfer A4-6

A4.11 Setpoint Limiters A4-6

A4.11.1 When PID Block Is in Auto Mode A4-6

A4.11.2 When PID Block Is in Cas or RCas Mode A4-7

A4.12 External-output Tracking A4-7

A4.13 Measured-value Tracking A4-7

A4.14 Initialization and Manual Fallback (IMan) A4-8

A4.15 Manual Fallback A4-8

A4.16 Auto Fallback A4-8

A4.17 Mode Shedding upon Computer Failure A4-9

A4.17.1 SHED_OPT A4-9

A4.18 Alarms A4-9

A4.18.1 Block Alarm (BLOCK_ALM) A4-9

A4.18.2 Process Alarms A4-9

A4.19 Example of Block Connections A4-10

A4.19.1 View Object for PID Function Block A4-10

Appendix 5. Link Master Functions A5-1

A5.1 Link Active Scheduler A5-1

A5.2 Link Master A5-1

A5.3 Transfer of LAS A5-2

A5.4 LM Functions A5-3

A5.5 LM Parameters A5-4

A5.5.1 LM Parameter List A5-4

A5.5.2 Descriptions for LM Parameters A5-6

A5.6 FAQs A5-9

Revision Information i

1. Introduction

This manual contains a description of the YTA320 Temperature Transmitter Fieldbus Communication Type. The Fieldbus communication type is based on the same dual sensor input features as that of the BRAIN or HART communication type and is similar to the BRAIN or HART communication type in terms of basic performance and operation. This manual describes only those topics that are required for operation of the Fieldbus communication type. Refer to the user's manual "YTA series Temperature Transmitter [Hardware]" (IM 01C50B01-01E) for topics common to other communication types.

■ Regarding This Manual

- This manual should be passed on to the end user.
- The contents of this manual are subject to change without prior notice.
- All rights reserved. No part of this manual may be reproduced in any form without Yokogawa's written permission.
- Yokogawa makes no warranty of any kind with regard to this manual, including, but not limited to, implied warranty of merchantability and fitness for a particular purpose.
- If any question arises or errors are found, or if any information is missing from this manual, please inform the nearest Yokogawa sales office.
- The specifications covered by this manual are limited to those for the standard type under the specified model number break-down and do not cover custom-made instrument.
- Please note that changes in the specifications, construction, or component parts of the instrument may not immediately be reflected in this manual at the time of change, provided that postponement of revisions will not cause difficulty to the user from a functional or performance standpoint.
- The following safety symbol marks are used in this Manual:

WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

IMPORTANT

Indicates that operating the hardware or software in this manner may damage it or lead to system failure.

NOTE

Draws attention to information essential for understanding the operation and features.

■ For Safe Use of Product

For the protection and safety of the operator and the instrument or the system including the instrument, please be sure to follow the instructions on safety described in this manual when handling this instrument. In case the instrument is handled in contradiction to these instructions, Yokogawa does not guarantee safety. Please give your attention to the followings.

(a) Installation

- The instrument must be installed by an expert engineer or a skilled personnel. The procedures described about INSTALLATION are not permitted for operators.
- In case of high process temperature, care should be taken not to burn yourself because the surface of the case reaches a high temperature.
- All installation shall comply with local installation requirement and local electrical code.

(b) Wiring

- The instrument must be installed by an expert engineer or a skilled personnel. The procedures described about WIRING are not permitted for operators.
- Please confirm that voltages between the power supply and the instrument before connecting the power cables and that the cables are not powered before connecting.

(c) Maintenance

- Please do not carry out except being written to a maintenance descriptions. When these procedures are needed, please contact nearest YOKOGAWA office.
- Care should be taken to prevent the build up of drift, dust or other material on the display glass and name plate. In case of its maintenance, soft and dry cloth is used.

(d) Modification

- Yokogawa will not be liable for malfunctions or damage resulting from any modification made to this instrument by the customer.

■ Warranty

- The warranty shall cover the period noted on the quotation presented to the purchaser at the time of purchase. Problems occurred during the warranty period shall basically be repaired free of charge.
- In case of problems, the customer should contact the Yokogawa representative from which the instrument was purchased, or the nearest Yokogawa office.
- If a problem arises with this instrument, please inform us of the nature of the problem and the circumstances under which it developed, including the model specification and serial number. Any diagrams, data and other information you can include in your communication will also be helpful.
- Responsible party for repair cost for the problems shall be determined by Yokogawa based on our investigation.
- The Purchaser shall bear the responsibility for repair costs, even during the warranty period, if the malfunction is due to:
  - Improper and/or inadequate maintenance by the purchaser.
  - Failure or damage due to improper handling, use or storage which is out of design conditions.
  - Use of the product in question in a location not conforming to the standards specified by Yokogawa, or due to improper maintenance of the installation location.
  - Failure or damage due to modification or repair by any party except Yokogawa or an approved representative of Yokogawa.
  - Malfunction or damage from improper relocation of the product in question after delivery.
  - Reason of force majeure such as fires, earthquakes, storms/floods, thunder/ lightening, or other natural disasters, or disturbances, riots, warfare, or radioactive contamination.

■ ATEX Documentation

This procedure is only applicable to the countries in European Union.

GB
All instruction manuals for ATEX Ex related products are available in English, German and French. Should you require Ex related instructions in your local language, you are to contact your nearest Yokogawa office or representative.

DK
Alle brugervejledninger for produkter relateret til ATEX Ex er tilgængelige på engelsk, tysk og fransk. Skulle De ønske yderligere oplysninger om håndtering af Ex produkter på eget sprog, kan De rette henvendelse herom til den nærmeste Yokogawa afdeling eller forhandler.

I
Tutti i manuali operativi di prodotti ATEX contrassegnati con Ex sono disponibili in inglese, tedesco e francese. Se si desidera ricevere i manuali operativi di prodotti Ex in lingua locale, mettersi in contatto con l'ufficio Yokogawa più vicino o con un rappresentante.

E
Todos los manuales de instrucciones para los productos antiexplosivos de ATEX están disponibles en inglés, alemán y francés. Si desea solicitar las instrucciones de estos artículos antiexplosivos en su idioma local, deberá ponerse en contacto con la oficina o el representante de Yokogawa más cercano.

NL
Alle handleidingen voor producten die te maken hebben met ATEX explosiebeveiliging (Ex) zijn verkrijgbaar in het Engels, Duits en Frans. Neem, indien u aanwijzingen op het gebied van explosiebeveiliging nodig hebt in uw eigen taal, contact op met de dichtstbijzijnde vestiging van Yokogawa of met een vertegenwoordiger.

SF
Kaikkien ATEX Ex -tyyppisten tuotteiden käyttöhjeet ovat saatavilla englannin-, saksan- ja ranskankielisinä. Mikäli tarvitsette Ex -tyyppisten tuotteiden ohjeita omalla paikallisella kielellännne, ottakaa yhteyttä lähimpään Yokogawa-toimistoon tai -edustajaan.

P
Todos os manuais de instruções referentes aos produtos Ex da ATEX estão disponíveis em Inglês, Alemão e Francês. Se necessitar de instruções na sua língua relacionadas com produtos Ex, deverá entrar em contacto com a delegação mais próxima ou com um representante da Yokogawa.

F
Tous les manuels d'instruction des produits ATEX Ex sont disponibles en langue anglaise, allemande et française. Si vous nécessitez des instructions relatives aux produits Ex dans votre langue, veuillez bien contacter votre représentant Yokogawa le plus proche.

D
Alle Betriebsanleitungen für ATEX Ex bezogene Produkte stehen in den Sprachen Englisch, Deutsch und Französisch zur Verfügung. Sollten Sie die Betriebsanleitungen für Ex-Produkte in Ihrer Landessprache benötigen, setzen Sie sich bitte mit Ihrem örtlichen Yokogawa-Vertreter in Verbindung.

S
Alla instruktionsböcker för ATEX Ex (explosionssäkra) produkter är tillgängliga på engelska, tyska och franska. Om Ni behöver instruktioner för dessa explosionssäkra produkter på annat språk, skall Ni kontakta närmaste Yokogawakontor eller representant.

GR
Όλα τα εγχειρίδια λειτουργίας των προϊόντων με ATEX Ex διατίθενται στα Αγγλικά, Γερμανικά και Γαλλικά. Σε περίπτωση που χρειάζεστε οδηγίες σχετικά με Ex στην τοπική γλώσσα παρακαλούμε επικοινωνήστε με το πλησιέστερο γραφείο της Yokogawa ή αντιπρόσωπο της.

SK
Všetky návody na obsluhu pre prístroje s ATEX Ex sú k dispozícii v jazyku anglickom, nemeckom a francúzskom. V prípade potreby návodu pre Ex-prístroje vo Vašom národnom jazyku, skontaktujte prosím miestnu kanceláriu firmy Yokogawa.

CZ
Všechny uživatelské příručky pro výrobky, na něž se vztahuje nevýbušné schválení ATEX Ex, jsou dostupné v angličtině, němčině a francouzštině. Požadujete-li pokyny týkající se výrobků s nevýbušným schválením ve vašem lokálním jazyku, kontaktujte prosím vaši nejbližší reprezentační kancelář Yokogawa.

LT
Visos gaminiø ATEX Ex kategorijos Eksploatavimo instrukcijos teikiami anglø, vokieèiø ir prancûzø kalbomis. Norëdami gauti prietaisø Ex dokumentacijà kitomis kalbomis susisiekite su artimiausiu bendrovës "Yokogawa" biuru arba atstovu.

LV
Visas ATEX Ex kategorijas izstrâdâjumu Lietoðanas instrukcijas tiek piegâdâtas angïu, vâcu un franèu valodâs. Ja vçlaties saòemt Ex ierîèu dokumentâciju citâ valodâ, Jums ir jâsazinâs ar firmas Jokogava (Yokogawa) tuvâko ofisu vai pârstâvi.

EST
Kõik ATEX Ex toodete kasutamisjuhendid on esitatud inglise, saksa ja prantsuse keeles. Ex seadmete muukeelse dokumentatsiooni saamiseks pöörduge lähima lokagava (Yokogawa) kontori või esindaja poole.

PL
Wszystkie instrukcje obsługi dla urządzeń w wykonaniu przeciwwybuchowym Ex, zgodnych z wymaganiami ATEX, dostępne są w języku angielskim, niemieckim i francuskim. Jeżeli wymagana jest instrukcja. obsługi w Państwa lokalnym ję zyku, prosimy o kontakt z najbliższym biurem Yokogawy.

SLO
Vsi predpisi in navodila za ATEX Ex sorodni pridelki so pri roki v angliščini, nemščini ter francoščini. Če so Ex sorodna navodila potrebna v vašem tukejnjem jeziku, kontaktirajte vaš najbliši Yokogawa office ili predstaunika.

H
Az ATEX Ex mûszerek gépkönyveit angol, német és francia nyelven adjuk ki. Amennyiben helyi nyelven kérik az Ex eszközök leírásait, kérjük keressék fel a legközelebbi Yokogawa irodát, vagy képviseletet.

BG
Всички упътвания за продукти от серията ATEX Ex се предлагат на английски, немски и френски език. Ако се нуждаете от упътвания за продукти от серията Ex на родния ви език, се свържете с най-близкия офис или представителство на фирма Yokogawa.

RO
Toate manualele de instructiuni pentru produsele ATEX Ex sunt in limba engleza, germana si franceza. In cazul in care doriti instructiunile in limba locala, trebuie sa contactati cel mai apropiat birou sau reprezentant Yokogawa.

M
Il-manwali kollha ta' l-istruzzjonijiet għal prodotti marbuta ma' ATEX Ex huma disponibbli bl-Ingliż, bil-Ġermaniż u bil-Franċiż. Jekk tkun teħtieġ struzzjonijiet marbuta ma' Ex fil-lingwa lokali tiegħek, għandek tikkuntattja lill-eqreb rappreżentan jew uffiċċju ta' Yokogawa.

2. Part Names

Refer to the individual instruction manuals for detailed descriptions of the parts. This section describes the topics applicable to the Fieldbus communication type.

(1) In the Fieldbus communication type, the amplifier(CPU) assembly consists of two boards, as shown in Figure 2.1.
(2) In other communication types, there's the pin switch which is used for selecting the direction of hardware burnout at the position of 'SW1' on the amplifier assembly, while Fieldbus communication type does not have this pin.
(3) The Fieldbus communication type has a simulation function. A SIMULATE-ENABLE switch is mounted at 'SW1' on the amplifier. Refer to Section 6.3, “Simulation Function” for details of the simulation function.

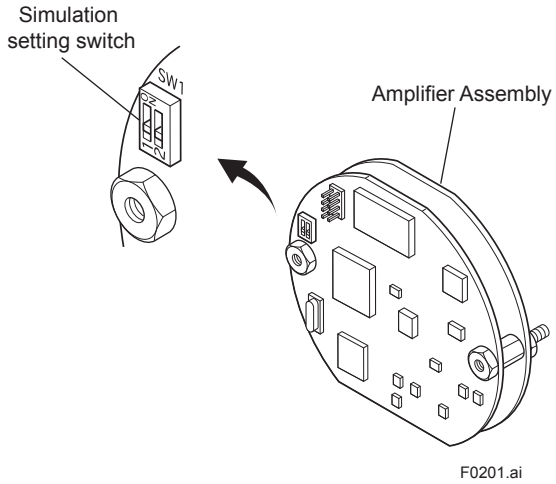


Figure 2.1 Diagram of the Amplifier Assembly

3. About Fieldbus

3.1 Outline

Fieldbus is a bi-directional digital communication protocol for field devices, which offers an advancement in implementation technologies for process control systems and is widely employed by numerous field devices.

YTA Series Fieldbus communication type employs the specification standardized by The Fieldbus Foundation, and provides interoperability between Yokogawa devices and those produced by other manufacturers. Fieldbus comes with software consisting of four AI function blocks and four DI function blocks, providing the means to implement a flexible instrumentation system.

For information on other features, engineering, design, construction work, startup and maintenance of Fieldbus, refer to “Fieldbus Technical Information” (TI 38K3A01-01E).

3.2 Internal Structure of YTA

The YTA contains two virtual field devices (VFD) that share the following functions.

3.2.1 System/network Management VFD

- Sets node addresses and Phisical Device tags (PD Tag) necessary for communication.
- Controls the execution of function blocks.
- Manages operation parameters and communication resources (Virtual Communication Relationship: VCR).

3.2.2 Function Block VFD

(1) Resource block (RS)

- Manages the status of YTA hardware.
- Automatically informs the host of any detected faults or other problems.

(2) Transducer block (TR)

- Accepts temperature input from sensors and transfers to AI function block.
- Operates limit swtich calculation and transfers to DI function block.

(3) AI function block

- Conditions raw data from the Transducer block.
- Outputs temperature signal.
- Carries out scaling, damping and square root extraction.

(4) DI function block

- Limit switch for temperature.
- Accepts the discrete signal from Transducer block and Outputs the discrete signal to show if the temperature exceeds the preset limit.

(5) PID function block

- Performs the PID control computation based on the deviation of the measured value from the setpoint.

3.3 Logical Structure of Each Block

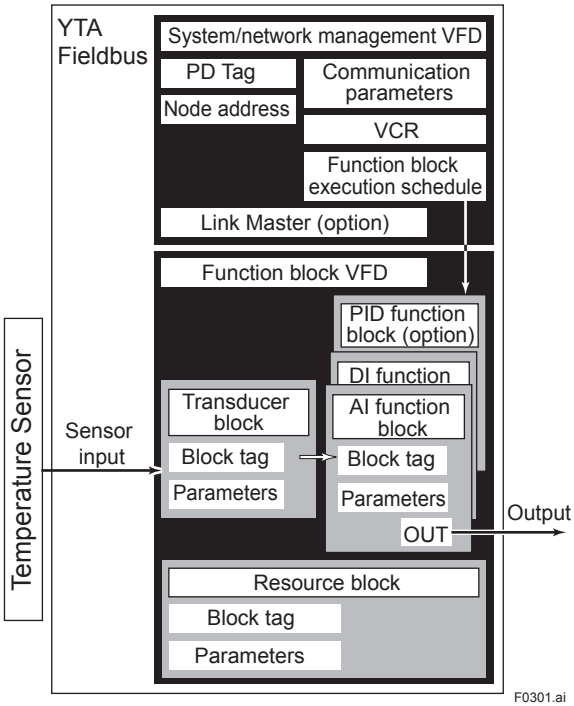


Figure 3.1 Logical Structure of Each Block

Setting of various parameters, node addresses, and PD Tags shown in Figure 3.1 is required before starting operation.

3.4 Wiring System Configuration

The number of devices that can be connected to a single bus and the cable length vary depending on system design. When constructing systems, both the basic and overall design must be carefully considered to allow device performance to be fully exhibited.

4. Getting Started

Fieldbus is fully dependent upon digital communication protocol and differs in operation from conventional 4 to 20 mA transmission and the BRAIN or HART communication protocol. It is recommended that novice users use field devices in accordance with the procedures described in this section. The procedures assume that field devices will be set up on a bench or an instrument shop.

4.1 Connection of Devices

The following instruments are required for use with Fieldbus devices:

- **Power supply:**

  Fieldbus requires a dedicated power supply. It is recommended that current capacity be well over the total value of the maximum current consumed by all devices (including the host). Conventional DC current cannot be used as is.

- **Terminator:**

  Fieldbus requires two terminators. Refer to the supplier for details of terminators that are attached to the host.

- **Field devices:**

  Connect Fieldbus communication type YTA320. Two or more YTA320 devices or other devices can be connected.

- **Host:**

  Used for accessing field devices. A dedicated host (such as DCS) is used for an instrumentation line while dedicated communication tools are used for experimental purposes. For operation of the host, refer to the instruction manual for each host. No details of the host are explained in the rest of this material.

- **Cable:**

  Used for connecting devices. Refer to “Fieldbus Technical Information” (TI 38K3A01-01E) for details of instrumentation cabling. If the total length of the cable is in a range of 2 to 3 meters for laboratory or other experimental use, the following simplified cable (a twisted pair wire with a cross section of 0.9 mm2 or more and cycle period of within 5 cm (2 inches) may be used. Termination processing depends on the type of device being deployed. For YTA, use an M4 screw terminal claw. Some hosts require a connector.

Refer to Yokogawa when making arrangements to purchase the recommended equipment.

Connect the devices as shown in Figure 4.1. Connect the terminators at both ends of the trunk, with a minimum length of the spur laid for connection.

The polarity of signal and power must be maintained.

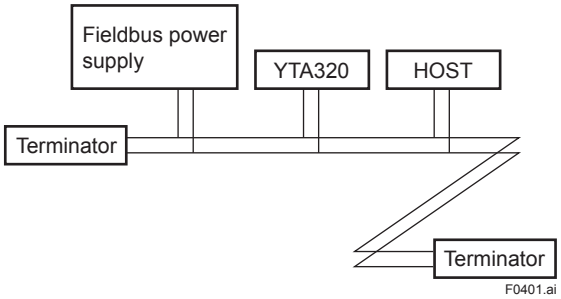


Figure 4.1 Cabling

NOTE

No CHECK terminal is used for Fieldbus communication YTA. Do not connect the field indicator and check meter. Use the instrument with the short-bar being installed between (-) terminal and the CHECK terminal.

Before using a Fieldbus configuration tool other than the existing host, confirm it does not affect the loop functionality in which all devices are already installed in operation. Disconnect the relevant control loop from the bus if necessary.

IMPORTANT

Connecting a Fieldbus configuration tool to a loop with its existing host may cause communication data scrambles resulting in a functional disorder or a system failure.

4.2 Host Setting

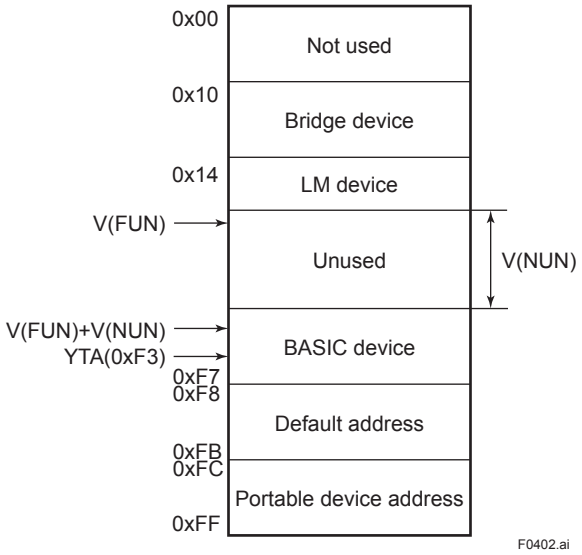
To activate Fieldbus, the following settings are required for the host.

IMPORTANT

Do not turn off the power immediately after setting. When the parameters are saved to EEPROM, the redundant processing is executed for the improvement of reliability. If the power is turned off within 60 seconds after setting is made, the modified parameters are not saved and the settings may return to the original values.

Table 4.1 Operation Parameters

Symbol	Parameter	Description and Settings
V (ST)	Slot-Time	Set 4 or greater value.
V (MID)	Minimum-Inter-PDU-Delay	Set 4 or greater value.
V (MRD)	Maximum-Response-Delay	Set so that V (MRD) × V (ST) is 12 or greater
V (FUN)	First-Unpolled-Node	Indicate the address next to the address range used by the host. Set 0x15 or greater.
V (NUN)	Number-of-consecutive-Unpolled-Node	Unused address range. YTA address is factory-set to 0xF3. Set this address to be within the range of the BASIC device in Figure 4.2.



Note 1: LM device: with bus control function (Link Master function)
Note 2: BASIC device: without bus control function

Figure 4.2 Available Address Range

4.3 Bus Power ON

Turn on the power of the host and the bus. Where the YTA is equipped with an LCD indicator, first all segments are lit, then the display begins to operate. If the indicator is not lit, check the polarity of the power supply.

Using the host device display function, check that the YTA is in operation on the bus.

The device information, including PD tag, Node address, and Device ID, is described on the sheet attached to YTA. The duplicates of device information are provided on this sheet.

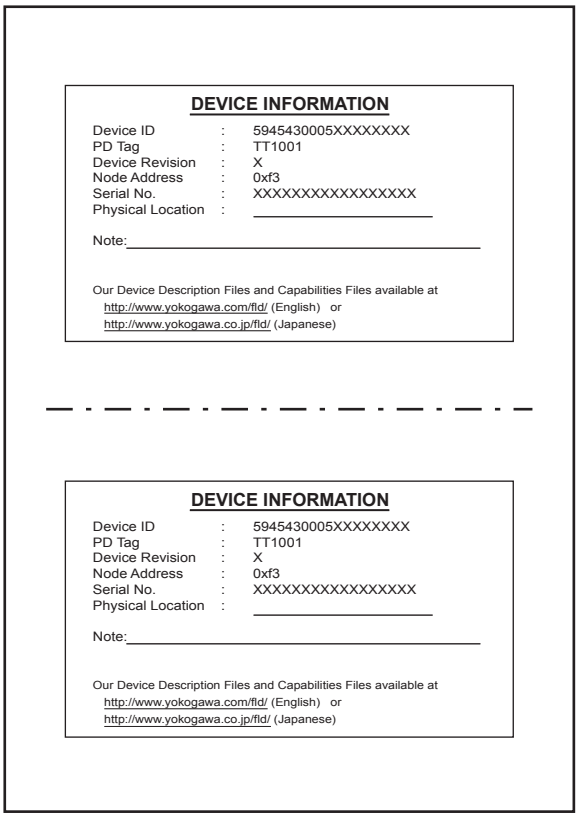


Figure 4.3 Device Information Sheet Attached to YTA

If no YTA is detected, check the available address range and the polarity of the power supply. If the node address and PD tag are not specified when ordering, default value is factory set. If two or more YTAs are connected at a time with default value, one YTA will keep the address upon shipment while the other will have a default address as they have the same initial addres. Separately connect each YTA and set a different address for each.

4.4 Integration of DD

If the host supports DD (Device Description), the DD of the YTA needs to be installed. Check if host has the following directory under its default DD directory.

594543\0005
(594543 is the manufacturer number of Yokogawa Electric Corporation, and 0005 is the YTA device number, respectively.)

If this directory is not found, DD of YTA has not been included. Create the above directory and copy the DD file (0m0n.ffo,0m0n.sym) (m, n is a numeral) into the directory. If you do not have the DD or capabilities files, you can download them from our web site. Visit the following web site.

http://www.yokogawa.com/fld

Once the DD is installed in the directory, the name and attribute of all parameters of the YTA are displayed.

Off-line configuration is possible by using capabilities files.

NOTE

Ensure to use the suitable file for the device. YTA has three types, one with the standard function blocks, one with /LC1(additional PID and LAS function) and one with /LC2(additional 2 PIDs and LAS function). If the different type capabilities file is used, some errors may occur at downloading to the device.

4.5 Reading the Parameters

To read YTA parameters, select the AI1 block of the YTA from the host screen and read the OUT parameter. The current temperature which is assign to AI1 block is displayed. Sensor 1 input is assigned to AI1 block upon shipment. Check that actual of MODE_BLOCK of the function block and resource block is set to Auto, and increase the temperature measured by Sensor1 and read the parameter again. A new designated value should be displayed.

4.6 Continuous Record of Values

If the host has a function of continuously recording the indications, use this function to list the indications (values). Depending on the host being used, it may be necessary to set the schedule of Publish (the function that transmits the indication on a periodic basis).

4.7 Generation of Alarm

If the host is allowed to receive alarms, generation of an alarm can be attempted from YTA. In this case, set the reception of alarms on the host side. YTA's VCR-6 is factory-set for this purpose. For practical purposes, all alarms are placed in a disabled status; for this reason, it is recommended that you first use one of these alarms on a trial basis. Set the value of link object-3 (index 30002) as "0, 298, 0, 6, 0". Refer to section 5.6.1 Link Object for details.

Since the LO_PRI parameter (index 4029) of the AI1 block is set to "0", try setting this value to "3". Select the Write function from the host in operation, specify an index or variable name, and write "3" to it.

The LO_LIM parameter (index 4030) of the AI1 block determines the limit at which the lower bound alarm for the process value is given. In usual cases, a very small value is set to this limit. Set the value which is apparantely higher than expected measured value to the limit. For example, in case masuering room temperature of 28°C, SET '50(°C)' to the limit. Since the measured temperature is lower than the limit, lower bound alarm is raised. Check that the alarm can be received at the host. When the alarm is confirmed, transmission of the alarm is suspended.

The above-mentioned items are a description of the simple procedure to be carried out until YTA is connected to Fieldbus. In order to take full advantage of the performance and functionality of the device, it is recommended that it be read together with Chapter 5, which describes how to use the YTA.

5. Configuration

This chapter contains information on how to adapt the function and performance of the YTA to suit specific applications. Because two or more devices are connected to Fieldbus, settings including the requirements of all devices need to be determined. Practically, the following steps must be taken.

(1) Network design

Determines the devices to be connected to Fieldbus and checks the capacity of the power supply.

(2) Network definition

Determines the tag and node addresses for all devices.

(3) Definition of combining function blocks

Determines the method for combination between each function block.

(4) Setting tags and addresses

Sets the PD Tag and node addresses one by one for each device.

(5) Communication setting

Sets the link between communication parameters and function blocks.

(6) Block setting

Sets the parameters for function blocks.

The following section describes each step of the procedure in the order given. Using a dedicated configuration tool allows the procedure to be significantly simplified. This section describes the procedure to be assigned for a host which has relatively simple functions. Refer to Appendix 5 when the YTA is used as Link Master.

5.1 Network Design

Select the devices to be connected to the Fieldbus network. The following instruments are necessary for operation of Fieldbus.

- **Power supply**

  Fieldbus requires a dedicated power supply. It is recommended that current capacity be well over the total value of the maximum current consumed by all devices (including the host). Conventional DC current cannot be used as is.

- **Terminator**

  Fieldbus requires two terminators. Refer to the supplier for details of terminators that are attached to the host.

- **Field devices**

  Connect the field devices necessary for instrumentation. YTA has passed the interoperability test conducted by The Fieldbus Foundation. In order to properly start Fieldbus, it is recommended that the devices used satisfy the requirements of the above test.

- **Host**

  Used for accessing field devices. A minimum of one device with bus control function is needed.

- **Cable**

  Used for connecting devices. Refer to “Fieldbus Technical Information” for details of instrumentation cabling. Provide a cable sufficiently long to connect all devices. For field branch cabling, use terminal boards or a connection box as required.

First, check the capacity of the power supply. The power supply capacity must be greater than the sum of the maximum current consumed by all devices to be connected to Fieldbus. The maximum current consumed (power supply voltage 9 V to 32 V) for YTA is 16.6 mA. The cable must have the spur in a minimum length with terminators installed at both ends of the trunk.

5.2 Network Definition

Before connection of devices with Fieldbus, define the Fieldbus network. Allocate PD Tag and node addresses to all devices (excluding such passive devices as terminators).

The PD Tag is the same as the conventional one used for the device. Up to 32 alphanumeric characters may be used for definition. Use a hyphen as a delimiter as required.

The node address is used to specify devices for communication purposes. Because data is too long for a PD Tag, the host uses the node address in place of the PD Tag for communication. A range of 16 to 247 (or hexadecimal 10 to F7) can be set. The device (LM device) with bus control function (Link Master function) is allocated from a smaller address number (16) side, and other devices (BASIC device) without bus control function allocated from a larger address number (247) side respectively. Place YTA in the range of the BASIC device. When the YTA is used as Link Master, place YTA in the range of LM device. Set the range of addresses to be used to the LM device. Set the following parameters.

Table 5.1 Parameters for Setting Address Range

Symbol	Parameters	Description
V (FUN)	First-Unpolled-Node	Indicates the address next to the address range used for the host or other LM device.
V (NUN)	Number-of-consecutive-Unpolled-Node	Unused address range.

The devices within the address range written as “Unused” in Figure 5.1 cannot be used on a Fieldbus. For other address ranges, the range is periodically checked to identify when a new device is mounted. Care must be taken not to allow the address range to become wider, which can lead to exhaustive consumption of Fieldbus communication performance.

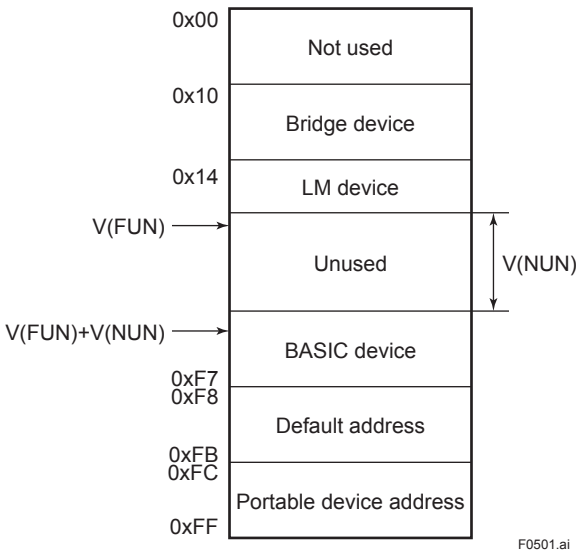


Figure 5.1 Available Range of Node Addresses

To ensure stable operation of Fieldbus, determine the operation parameters and set them to the LM devices. While the parameters in Table 5.2 are to be set, the worst-case value of all the devices to be connected to the same Fieldbus must be used. Refer to the specification of each device for details. Table 5.2 lists YTA specification values.

Table 5.2 Operation Parameter Values of the YTA to be Set to LM Devices

Symbol	Parameters	Description and Settings
V (ST)	Slot-Time	Indicates the time necessary for immediate reply of thje device. Unit of time is in octets (256 µs). Set maximum specification for all devices. For YTA, set a value of 4 or greater.
V (MID)	Minimum-Inter-PDU-Delay	Minimum value of communication data intervals. Unit of time is in octets (256 µs). Set the maximum specification for all devices. For YTA, set a value of 4 or greater.
V (MRD)	Maximum-Reply-Delay	The worst case time elapsed until a reply is recorded. The unit is Slot-time; set the value so that V (MRD) × V (ST) is the maximum value of the specification for all devices. For YTA, the setting must be a value of 12 or greater.

5.3 Definition of Combining Function Blocks

The input/output parameters for function blocks are combined. For the YTA, four AI blocks output parameter (OUT), four DI blocks output parameter (OUT_D) and PID block are subject to combination. They are combined with the input of the control block as necessary. Practically, setting is written to the YTA link object with reference to “Block setting” in Section 5.6 for details. It is also possible to read values from the host at proper intervals instead of connecting the YTA block output to other blocks.

The combined blocks need to be executed synchronously with other blocks on the communications schedule. In this case, change the YTA schedule according to the following table. Enclosed values in the table are factory-settings.

Table 5.3 Execution Schedule of the YTA Function Blocks

Index	Parameters	Setting (Enclosed is factory-setting)
269 (SM)	MACROCYCLE_ DURATION	Cycle (MACROCYCLE) period of control or measurement. Unit is 1/32 ms. (16000 = 0.5 s)
276 (SM)	FB_START_ENTRY.1	AI1 block startup time. Elapsed time from the start of MACROCYCLE specified in 1/32 ms. (0 = 0 s)
277 (SM)	FB_START_ENTRY.2	AI2 block startup time. Elapsed time from the start of MACROCYCLE specified in 1/32 ms. (4000 = 125 ms)
278 to 285 (SM)	FB_START_ENTRY.3 to FB_START_ENTRY.10	Not used.

A maximum of 50 ms is taken for execution of each AI block. A maximum of 30 ms is taken for execution of each DI block, and 100ms for each PID block. For scheduling of communications for combination with the next function block, the execution is so arranged as to start after a lapse of longer than 100 ms. In no case should function blocks of the YTA be executed at the same time (execution time is overlapped).

Figure 5.3 shows an example of schedule based on the loop shown in Figure 5.2.

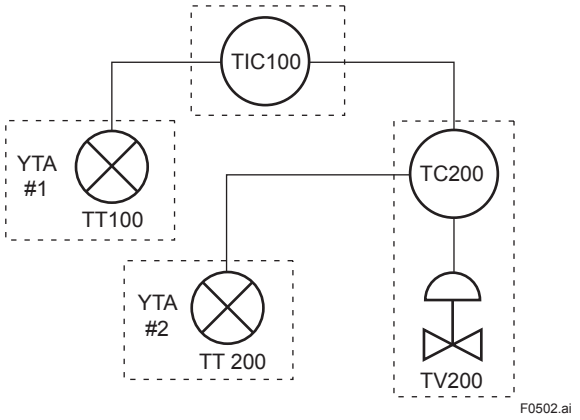


Figure 5.2 Example of Loop Connecting Function Block of Two YTA with Other Instruments

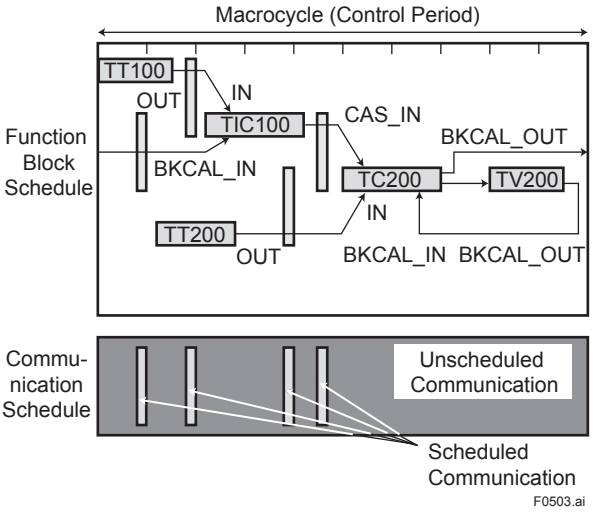


Figure 5.3 Function Block Schedule and Communication Schedule

When the control period (macrocycle) is set to more than 4 seconds, set the following interval to be more than 1% of the control period.

- Interval between “end of block execution” and “start of sending CD from LAS”
- Interval between “end of block execution” and “start of the next block execution”

5.4 Setting of Tags and Addresses

This section describes the steps in the procedure to set PD Tags and node addresses in the YTA. There are three states of Fieldbus devices as shown in Figure 5.4, and if the state is other than the lowest SM_OPERATIONAL state, no function block is executed. YTA must be transferred to this state when an YTA tag or address is changed.

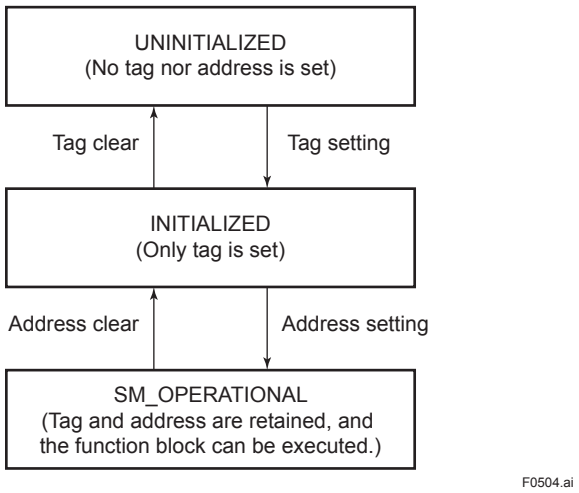


Figure 5.4 Status Transition by Setting PD Tag and Node Address

YTA has a PD Tag (TT1001) and node address (243, or hexadecimal 0xF3) that are set upon shipment from the factory unless otherwise specified. To change only the node address, clear the address once and then set a new node address. To set the PD Tag, first clear the node address and clear the PD Tag, then set the PD Tag and node address again.

Devices whose node address was cleared will await the default address (randomly chosen from a range of 248 to 251, or from hexadecimal F8 to FB). At the same time, it is necessary to specify the device ID in order to correctly specify the device. The device ID of the YTA is 5945430005xxxxxxxx. (The xxxxxxxx at the end of the above device ID is a total of 8 alphanumeric characters.)

5.5 Communication Setting

To set the communication function, it is necessary to change the database residing in SM-VFD.

5.5.1 VCR Setting

Set VCR (Virtual Communication Relationship), which specifies the called party for communication and resources. YTA has 30 VCRs whose application can be changed, except for the first VCR, which is used for management.

YTA has VCRs of four types:

Server(QUB) VCR
: A Server responds to requests from a host. This communication needs data exchange. This type of communication is called QUB (Queued User-triggered Bidirectional) VCR.

Source (QUU) VCR
: A Source multicasts alarms or trends to other devices. This type of communication is called QUU (Queued User-triggered Unidirectional) VCR.

Publisher (BNU) VCR
: A Publisher multicasts AI block and DI block output to another function block(s). This type of communication is called BNU (Buffered Network-triggered Unidirectional) VCR.

Subscriber (BNU) VCR
: A Subscriber receives output of another function block(s) by PID block.

A Server VCR is capable to respond to requests from a Client (QUB) VCR after the Client initiates connection to the Server successfully. A Source VCR transmits data without established connection. A Sink (QUU) VCR on another device can receive it if the Sink is configured so. A Publisher VCR transmits data when LAS requests so. An explicit connection is established from Subscriber (BNU) VCR(s) so that a Subscriber knows the format of published data.

Each VCR has the parameters listed in Table 5.4. Parameters must be changed together for each VCR because modification for each parameter may cause inconsistent operation.

Table 5.4 VCR Static Entry

Sub-index	Parameter	Description
1	FasArTypeAndRole	Indicates the type and role of communication (VCR). The following 4 types are used for YTA. 0x32: Server (Responds to requests from host.) 0x44: Source (Transmits alarm or trend.) 0x66: Publisher (Sends AI block output to other blocks.) 0x76: Subscriber (Receives output of other blocks by PID block.)
2	FasDllLocalAddr	Sets the local address to specify VCR in YTA. A range of 20 to F7 in hexadecimal.
3	FasDllConfigured RemoteAddr	Sets the node address of the called party for communication and the address (DLSAP or DLCEP) used to specify VCR in that address. For DLSAP or DLCEP, a range of 20 to F7 in hexadecimal is used. Addresses in Subindex 2 and 3 need to be set to the same contents of the VCR as the called party (local and remote are reversed).
4	FasDllSDAP	Specifies the quality of communication. Usually, one of the following types is set. 0x2B: Server 0x01: Source (Alert) 0x03: Source (Trend) 0x91: Publisher/Subscriber
5	FasDllMaxConfirm DelayOnConnect	To establish connection for communication, a maximum wait time for the called party's response is set in ms. Typical value is 60 seconds (60000).
6	FasDllMaxConfirm DelayOnData	For request of data, a maximum wait time for the called party's response is set in ms. Typical value is 60 seconds (60000).
7	FasDllMaxDlsduSize	Specifies maximum DL Service Data unit Size (DLSDU). Set 256 for Server and Trend VCR, and 64 for other VCRs.
8	FasDllResidual ActivitySupported	Specifies whether connection is monitored. Set TRUE (0xff) for Server. This parameter is not used for other communication.
9	FasDllTimelinessClass	Not used for YTA.
10	FasDllPublisherTime WindowSize	Not used for YTA.
11	FasDllPublisher SynchronizaingDlcep	Not used for YTA.
12	FasDllSubsriberTime WindowSize	Not used for YTA.
13	FasDllSubscriber SynchronizationDlcep	Not used for YTA.
14	FmsVfdId	Sets VFD for YTA to be used. 0x1: System/network management VFD 0x1234: Function block VFD
15	FmsMaxOutstanding ServiceCalling	Set 0 to Server. It is not used for other applications.
16	FmsMaxOutstanding ServiceCalled	Set 1 to Server. It is not used for other applications.
17	FmsFeatures Supported	Indicates the type of services in the application layer. In the YTA, it is automatically set according to specific applications.

30 VCRs are factory-set as shown in the table below.

Table 5.5 VCR List

Index (SM)	VCR Number	Factory Setting
293	1	For system management (Fixed)
294	2	Server (LocalAddr = 0xF3)
295	3	Server (LocalAddr = 0xF4)
296	4	Server (LocalAddr = 0xF7)
297	5	Trend Source (LocalAddr = 0x07, Remote Address=0x111)
298	6	Alert Source (LocalAddr = 0x07, Remote Address=0x110)
299 to 322	7 to 30	Not used.

5.5.2 Function Block Execution Control

According to the instructions given in Section 5.3, set the execution cycle of the function blocks and schedule of execution.

5.6 Block Setting

Set the parameter for function block VFD.

5.6.1 Link Object

Link object combines the data voluntarily sent by the function block with VCR. YTA has 26 link objects. A single link object specifies one combination. Each link object has the parameters listed in Table 5.6.

Parameters must be changed together for each VCR because the modifications made to each parameter may cause inconsistent operation.

Table 5.6 Link Object Parameters

Sub-index	Parameters	Description
1	LocalIndex	Sets the index of function block parameters to be combined; set “0” for Trend and Alert.
2	VcrNumber	Sets the index of VCR to be combined. If set to “0”, this link object is not used.
3	RemoteIndex	Not used in YTA.Set to “0”.
4	ServiceOperation	Set one of the following. Set only one each for link object for Alert or Trend. 0: Undefined 2: Publisher 3: Subscriber 6: Alert 7: Trend
5	StaleCountLimit	Set the maximum number of consecutive stale input values which may be received before the input status is set to BAD. To avoid the unnecessary mode transition caused when the data is not correctly received by subscriber, set this parameter to “2” or more.

26 Link objects are not factory-set.

5.6.2 Trend Object

It is possible to set the parameter so that the function block automatically transmits Trend. YTA has ten Trend objects, six of which are used for Trend in analog mode parameters and four is used for Trend in discrete mode parameter. A single Trend object specifies the trend of one parameter.

Each Trend object has the parameters listed in Table 5.8. The first four parameters are the items to be set.

Table 5.8 Parameters for Trend Objects

Sub-index	Parameters	Description
1	Block Index	Sets the leading index of the function block that takes a trend.
2	Parameter Relative Index	Sets the index of parameters taking a trend by a value relative to the beginning of the function block.
3	Sample Type	Specifies how trends are taken. Choose one of the following 2 types: 1: Sampled upon execution of a function block. 2: The average value is sampled.
4	Sample Interval	Specifies sampling intervals in units of 1/32 ms. Set the integer multiple of the function block execution cycle.
5	Last Update	The last sampling time.
6 to 21	List of Status	Status part of a sampled parameter.
21 to 37	List of Samples	Data part of a sampled parameter.

Five trend objects are factory-set as shown Table 5.9.

Table 5.9 Trend Object are Factory-Set

Index	Parameters	Factory Settings
32000 to 32005	TREND_FLT.1 to TREND_FLT.6	Not used.
32006 to 32010	TREND_DIS.1 to TREND_DIS.4	Not used.

5.6.3 View Object

This is the object to form groups of parameters in a block. One of advantage brought by forming groups of parameters is the reduction of load for data transaction. YTA has four View Objects for each Resource block, Transducer block and each function block, and each View Object has the parameters listed in Table 5.11 to 5.13.

Table 5.10 Purpose of Each View Object

	Description
VIEW_1	Set of dynamic parameters required by operator for plant operation. (PV, SV, OUT, Mode etc.)
VIEW_2	Set of static parameters which need to be shown to plant operator at once. (Range etc.)
VIEW_3	Set of all the dynamic parameters.
VIEW_4	Set of static parameters for configuration or maintenance.

Table 5.11 View Object for Resource Block

Relative index	Parameter	VIEW 1	VIEW 2	VIEW 3	VIEW 4
1	ST_REV	2	2	2	2
2	TAG_DESC				
3	STRATEGY				2
4	ALERT_KEY				1
5	MODE_BLK	4		4	
6	BLOCK_ERR	2		2	
7	RS_STATE	1		1	
8	TEST_RW				
9	DD_RESOURCE				
10	MANUFAC_ID				4
11	DEV_TYPE				2
12	DEV_REV				1
13	DD_REV				1
14	GRANT_DENY		2		
15	HARD_TYPES				2
16	RESTART				
17	FEATURES				2
18	FEATURE_SEL		2		
19	CYCLE_TYPE				2
20	CYCLE_SEL		2		
21	MIN_CYCLE_T				4
22	MEMORY_SIZE				2
23	NV_CYCLE_T		4		
24	FREE_SPACE		4		
25	FREE_TIME	4		4	
26	SHED_RCAS		4		
27	SHED_ROUT		4		
28	FAULT_STATE	1		1	
29	SET_FSTATE				
30	CLR_FSTATE				
31	MAX_NOTIFY				1
32	LIM_NOTIFY		1		
33	CONFIRM_TIME		4		
34	WRITE_LOCK		1		
35	UPDATE_EVT				
36	BLOCK_ALM				
37	ALARM_SUM	8		8	
38	ACK_OPTION				2
39	WRITE_PRI				1
40	WRITE_ALM				
41	ITK_VER				2
42	SOFT_REV				
43	SOFT_DESC				
44	SIM_ENABLE_MSG				
45	DEVICE_STATUS_1			4	
46	DEVICE_STATUS_2			4	
47	DEVICE_STATUS_3			4	
48	DEVICE_STATUS_4			4	
49	DEVICE_STATUS_5			4	
50	DEVICE_STATUS_6			4	
51	DEVICE_STATUS_7			4	
52	DEVICE_STATUS_8			4	
	Total in byte	22	30	54	31

Table 5.12 View Object for Transducer Block

Relative index	Parameter	VIEW 1	VIEW 2	VIEW 3	VIEW 4 (1st)	VIEW 4 (2nd)	VIEW 4 (3rd)	VIEW 4 (4th)	VIEW 4 (5th)
1	ST_REV	2	2	2	2	2	2	2	2
2	TAG_DESC								
3	STRATEGY				2				
4	ALERT_KEY				1				
5	MODE_BLK	4		4					
6	BLOCK_ERR	2		2					
7	UPDATE_EVT								
8	BLOCK_ALM								
9	TRANSDUCER_DIRECTORY								
10	TRANSDUCER_TYPE	2	2	2	2				
11	XD_ERROR	1		1					
12	COLLECTION_DIRECTORY								
13	PRIMARY_VALUE_TYPE_1		2						
14	PRIMARY_VALUE_1	5		5					
15	PRIMARY_VALUE_RANGE_1					11			
16	CAL_POINT_HI_1		4						
17	CAL_POINT_LO_1		4						
18	CAL_MIN_SPAN_1					4			
19	CAL_UNIT_1					2			
20	SENSOR_TYPE_1					2			
21	SENSOR_RANGE_1					11			
22	SENSOR_SN_1					32			
23	SENSOR_CAL_METHOD_1						1		
24	SENSOR_CAL_LOC_1						32		
25	SENSOR_CAL_DATE_1						6		
26	SENSOR_CAL_WHO_1						32		
27	SENSOR_CONNECTION_1					2			
28	PRIMARY_VALUE_TYPE_2		2						
29	PRIMARY_VALUE_2	5		5					
30	PRIMARY_VALUE_RANGE_2							11	
31	CAL_POINT_HI_2		4						
32	CAL_POINT_LO_2		4						
33	CAL_MIN_SPAN_2							4	
34	CAL_UNIT_2							2	
35	SENSOR_TYPE_2							2	
36	SENSOR_RANGE_2							11	
37	SENSOR_SN_2							32	
38	SENSOR_CAL_METHOD_2								1
39	SENSOR_CAL_LOC_2								32
40	SENSOR_CAL_DATE_2								6
41	SENSOR_CAL_WHO_2								32
42	SENSOR_CONNECTION_2							2	
43	SECONDARY_VALUE			5					
44	SECONDARY_VALUE_UNIT				2				
45	MODULE_SN				32				
46	ALARM_SUM			8					
47	PRIMARY_VALUE_FTIME_1		4						
48	CAL_STATE_1					1			
49	CJC_SELECT_1					1			
50	CONSTANT_CJC_TEMP_1					4			

Relative index	Parameter	VIEW 1	VIEW 2	VIEW 3	VIEW 4 (1st)	VIEW 4 (2nd)	VIEW 4 (3rd)	VIEW 4 (4th)	VIEW 4 (5th)
51	WIRING_RESISTANCE_1					4			
52	SENSOR_MATCH_R0_1								
53	SENSOR_MATCH_A_1								
54	SENSOR_MATCH_B_1								
55	SENSOR_MATCH_C_1								
56	SENSOR_MATCH_ALPHA_1								
57	SENSOR_MATCH_DELTA_1								
58	SENSOR_MATCH_BETA_1								
59	PRIMARY_VALUE_FTIME_2		4						
60	CAL_STATE_2							1	
61	CJC_SELECT_2							1	
62	CONSTANT_CJC_TEMP_2							4	
63	WIRING_RESISTANCE_2							4	
64	SENSOR_MATCH_R0_2								
65	SENSOR_MATCH_A_2								
66	SENSOR_MATCH_B_2								
67	SENSOR_MATCH_C_2								
68	SENSOR_MATCH_ALPHA_2								
69	SENSOR_MATCH_DELTA_2								
70	SENSOR_MATCH_BETA_2								
71	SECONDARY_VALUE_FTIME				1				
72	DIFFERENTIAL_VALUE	5		5					
73	DIFFERENTIAL_UNIT				2				
74	DIFFERENTIAL_VALUE_FTIME		4						
75	AVERAGE_VALUE	5		5					
76	AVERAGE_UNIT				2				
77	AVERAGE_VALUE_FTIME		4						
78	BACKUP_VALUE	5		5					
79	BACKUP_UNIT				2				
80	BACKUP_RETURN_SENSOR1								
81	SENSOR_BURNOUT_DETECT								
82	LIMSW_1_VALUE_D	2		2					
83	LIMSW_1_TARGET		1						
84	LIMSW_1_SETPOINT		4						
85	LIMSW_1_ACT_DIRECTION				1				
86	LIMSW_1_HYSTERESIS				4				
87	LIMSW_1_UNIT				2				
88	LIMSW_2_VALUE_D	2		2					
89	LIMSW_2_TARGET		1						
90	LIMSW_2_SETPOINT		4						
91	LIMSW_2_ACT_DIRECTION				1				
92	LIMSW_2_HYSTERESIS				4				
93	LIMSW_2_UNIT				2				
94	LIMSW_3_VALUE_D	2		2					
95	LIMSW_3_TARGET		1						
96	LIMSW_3_SETPOINT		4						
97	LIMSW_3_ACT_DIRECTION				1				
98	LIMSW_3_HYSTERESIS				4				
99	LIMSW_3_UNIT				2				
100	LIMSW_4_VALUE_D	2		2					

Relative index	Parameter	VIEW 1	VIEW 2	VIEW 3	VIEW 4 (1st)	VIEW 4 (2nd)	VIEW 4 (3rd)	VIEW 4 (4th)	VIEW 4 (5th)
101	LIMSW_4_TARGET		1						
102	LIMSW_4_SETPOINT		4						
103	LIMSW_4_ACT_DIRECTION				1				
104	LIMSW_4_HYSTERESIS				4				
105	LIMSW_4_UNIT				2				
106	DISPLAY_AI_OUT				1				
107	DISPLAY_ERROR				1				
108	DISPLAY_WARNING				1				
109	DISPLAY_ADDR				1				
110	DISPLAY_CYCLE				1				
111	WARNING_ENABLE_1				4				
112	WARNING_ENABLE_2				4				
113	WARNING_ENABLE_3				4				
114	WARNING_ENABLE_4				4				
115	MODEL								
116	YTA_OPTION				2				
	Total in byte	44	60	57	99	76	73	76	73

Table 5.13 View Object for AI Function Block

Relative index	Parameter	VIEW 1	VIEW 2	VIEW 3	VIEW 4
1	ST_REV	2	2	2	2
2	TAG_DESC				
3	STRATEGY				2
4	ALERT_KEY				1
5	MODE_BLK	4		4	
6	BLOCK_ERR	2		2	
7	PV	5		5	
8	OUT	5		5	
9	SIMULATE				
10	XD_SCALE		11		
11	OUT_SCALE		11		
12	GRANT_DENY		2		
13	IO_OPTS				2
14	STATUS_OPTS				2
15	CHANNEL				2
16	L_TYPE				1
17	LOW_CUT				4
18	PV_FTIME				4
19	FIELD_VAL	5		5	
20	UPDATE_EVT				
21	BLOCK_ALM				
22	ALARM_SUM	8		8	
23	ACK_OPTION				2
24	ALARM_HYS				4
25	HI_HI_PRI				1
26	HI_HI_LIM				4
27	HI_PRI				1
28	HI_LIM				4
29	LO_PRI				1
30	LO_LIM				4
31	LO_LO_PRI				1
32	LO_LO_LIM				4
33	HI_HI_ALM				
34	HI_ALM				
35	LO_ALM				
36	LO_LO_ALM				
	Total in byte	31	26	31	46

Table 5.14 View Object for DI Function Block

Relative index	Parameter	VIEW 1	VIEW 2	VIEW 3	VIEW 4
1	ST_REV	2	2	2	2
2	TAG_DESC				
3	STRATEGY				2
4	ALERT_KEY				1
5	MODE_BLK	4		4	
6	BLOCK_ERR	2		2	
7	PV_D	2		2	
8	OUT_D	2		2	
9	SIMULATE_D				
10	XD_STATE		2		
11	OUT_STATE		2		
12	GRANT_DENY		2		
13	IO_OPTS				2
14	STATUS_OPTS				2
15	CHANNEL				2
16	PV_FTIME				4
17	FIELD_VAL_D	2		2	
18	UPDATE_EVT				
19	BLOCK_ALM				
20	ALARM_SUM	8		8	
21	ACK_OPTION				2
22	DISC_PRI				1
23	DISC_LIM				1
24	DISC_ALM				
	Total in byte	22	8	22	19

Table 5.15 Indexes of View for Each Block

		VIEW 1	VIEW 2	VIEW 3	VIEW 4
Resource block		40100	40101	40102	40103
Transducer block		40200	40201	40202	40203 -40207
AI Function block	1	40400	40401	40402	40403
	2	40410	40411	40412	40413
	3	40420	40421	40422	40423
	4	40430	40431	40432	40433
DI Function block	1	40600	40601	40602	40603
	2	40610	40611	40612	40613
	3	40620	40621	40622	40623
	4	40630	40631	40632	40633
PID Function block	1	40800	40801	40802	40803
	2	40810	40811	40812	40813

5.6.4 Parameters of Transducer Block

The transducer block makes settings for the temperature transmitter-specific functions of the YTA320, such as the temperature input and display settings. See Appendix 1 for a list of all parameters of the YTA320; this section describes only the settings for important parameters.

Note that you can choose "°C" or "Kelvin" as the unit of temperature. "°F" or "°R" can also be selected for a model with the option code /D2.

- **Mode Setting Parameter**

  MODE_BLK
  Supports O/S and Auto modes. In the O/S mode, the transducer block does not function, as implied by the mode name "Out of Service."

- **Parameters Related to Sensor Input**

  The number "2" enclosed in parentheses appearing in the following parameter names and descriptions indicates that the preceding number "1" should be read as "2" for the cases of sensor 2, respectively.

  SENSOR_TYPE_1 (2)
  Shows and stipulates the type of sensor connected to sensor input 1 (or 2). The following sensors can be connected.
  - Thermocouple:
    Types B, E, J, K, N, R, S, and T (IEC584), types L and U (DIN43710), and Types W3 and W5 (ASTM E-988)
  - 2-/3-/4-wire RTD:
    Pt100, Pt200, Pt500 (IEC751) JPt100 (JIS), Ni120, Cu (SAMARC21-4)
  - 2-/3-/4-wire resistance input
  - 2-wire DC mV input

IMPORTANT

Whenever 4-wire input is specified for Sensor 1, set 'Non Connection' for Sensor 2.
4-wire input cannot be used as Sensor 2.

SENSOR_CONNECTION_1 (2)
Shows and stipulates the number of wires connected to sensor input 1 (or 2). This setting only valid for RTD and resistance input.

PRIMARY_VALUE_1 (2)
Shows the value and status of the input from sensor 1 (or 2). The unit set in PRIMARY_VALUE_RANGE_1 (or ..._2) applies to the unit of the value. The damping time constant is set in PRIMARY_VALUE_FTIME_1 (or ..._2).

NOTE

If an input exceeds the range shown in PRIMARY_VALUE_RANGE_1(2), the value up to 120% of the range will be output for upper limit side, and -20% of the range will be output for lower limit side. In thie case, the accuracy of the input exceeding the range shall not be guaranteed.

SECONDARY_VALU
Shows the value and status of the terminal board temperature. The unit of temperature is set in SECONDARY_VALUE_UNIT, and the damping time constant in SECONDARY_VALUE_FTIME.

DIFFERENTIAL_VALUE
Shows the value and status of the difference between 2 inputs [sensor 1 input value minus sensor 2 input value] when 2 sensors are connected. The unit of temperature is set in DIFFERENTIAL_UNIT, and the damping time constant in DIFFERENTIAL_VALUE_FTIME. When there is no connection to sensor 2 input, the status of DIFFERENTIAL_VALUE is Bad and the value is undefined.

AVERAGE_VALUE
Shows the value and status of the average of 2 inputs when 2 sensors are connected. The unit of temperature is set in AVERAGE_UNIT, and the damping time constant in AVERAGE_VALUE_FTIME. When there is no connection to sensor 2 input, the status of AVERAGE_VALUE is Bad and the value is undefined.

BACKUP_VALUE
When 2 sensors are connected, this parameter normally shows the value input from sensor 1, and in case of burnout of sensor 1 (when the backup action becomes active), shows the value input from sensor 2. The unit and damping time constant follow the respective settings for the input currently selected.

If you want to switch back to select sensor 1 input while the backup action is active after the sensor 1 input recovers, set 1 (Enable) in BACKUP_RETURN_SENSOR1. Because this data is not retained, set 1(Enable) in the parameter every switch back.
When there is no connection to sensor 2 input, the status of BACKUP_VALUE is Bad and the value is undefined.

- **Parameters Related to Limit Switches**

  Parameters whose names begin with "LIMSW" store the settings for limit switch signals output to DI function blocks. The transducer block has 4 limit switches numbered from 1 to 4, and these parameters determine the specifications of the respective switches. In the following parameter names and descriptions, read the number "1" as "2," "3," or "4" according to the intended limit switch number.

  LIMSW_1_VALUE_D
  Stores the value and status of limit switch 1.

  LIMSW_1_TARGET
  Stipulates the value that should be compared with the threshold. PRIMARY_VALUE_1, PRIMARY_VALUE_2, SECONDARY_VALUE, DIFFERENTIAL_VALUE, AVERAGE_VALUE, or BACKUP_VALUE can be chosen.

  LIMSW_1_SETPOINT
  Stipulates the threshold of switching on limit switch 1.

  LIMSW_1_ACT_DIRECTION
  Stipulates whether limit switch 1 should work as a high limit switch or low limit switch.

  LIMSW_1_HYSTERESIS
  Stipulates the hysteresis of limit switch 1.

- **Parameters Related to Display**

  For a model with the Integral indicator, the display information can be selected by parameters that have names beginning with "DISPLAY." For the details of contents to be displayed, refer to section 6.4.

  DISPLAY_AI_OUT

  Specify an AI block number or numbers to select the AI blocks whose output values should be displayed on the LCD. If two or more AI blocks are selected, the respective values are displayed in turn cyclically.

  DISPLAY_ERROR
  Select whether to display the error code on the LCD. Selecting 1 (INHIBIT) will hide the error code from the LCD even when an error occurs.

  DISPLAY_WARNING
  Select whether to display the warning code on the LCD. Even if this parameter is set to 'SHOW', error code for warning will not be shown when the functions themselves are disabled by parameters WARNING_ENABLE_ #.

  DISPLAY_ADDRESS
  Select whether to display the device address on the LCD.

  DISPLAY_CYCLE
  Sets the display refresh cycle.

- **Parameters Related to Warnings**

  Faults found as a result of self-diagnostics of the YTA320 are categorized into errors and warnings. Warnings can be hidden from the LCD as necessary by changing the values of the parameters below. Refer section 7.4 for the notes on using Warning function.

  WARNING_ENABLE_1, (2, 3, 4)
  Switches on and off the generation of warnings.

- **Parameters Related to Input Calibrations**

  The number "2" enclosed in parentheses appearing in the following parameter names and descriptions indicates that the preceding number "1" should be read as "2" for the cases of sensor 2, respectively.

  CAL_STATE_1 (2)
  Shows if user adjustment function for Sensor1(2) input is invalid(User Cal off) or valid(User cal on). Setting '2(Calibration Exec)' will allow users to adjust the input.

IMPORTANT

If you changing the sensor type once after making user adjustment function valid, re-do user adjustment or set '0(User Cal off)' to CAL_ STATE_1 (2) to make the function off.

CAL_POINT_HI_1 (2), CAL_POINT_LO_1 (2)
These parameters store the calibrated upper and lower range limit values for sensor input 1 (or 2). To perform a calibration, apply a voltage (for a thermocouple or voltage input) or a resistance (for a RTD or resistance input) between the corresponding input terminals, and write the applied level to these parameters. The values written must meet the following conditions:

CAL_POINT_HI_1 > CAL_POINT_LO_1
CAL_POINT_HI_2 > CAL_POINT_LO_2

The table below shows the recommended input levels for calibrations.

Table 5.16 Recommended Input Levels for Calibration

Input Type	Sensor Type	Input	
		Low Level (CAL_POINT_LO_1/2)	High Level (CAL_POINT_HI_1/2)
Thermocouple	Type B, R, S, or T	0 mV	25 mV
	Type E, J, K, N, W3, W5, L, U	0 mV	75 mV
RTD	Pt100, JPt100, Ni120, Cu	40Ω	330Ω
	Pt200, Pt500	40Ω	1600Ω
DC mV	mV	0 mV	75 mV
Resistance	Ohm	40Ω	1600Ω

5.6.5 Parameters of AI Function Block

Parameters of function blocks can be read and written from a host computer. See Appendix 1 for a list of all parameters of the YTA320. For a model incorporating the PID function block and link master feature, see Appendixes 4 and 5. This section describes only the settings for important parameters of each AI block.

MODE_BLK
Supports O/S, Auto, and Manual modes. The AI block does not function in the O/S mode, does not update the measured value in the Manual mode, and updates the measured value in the Auto mode. Normally, set the mode to Auto. Before the YTA320 is shipped from the factory, AI1 and AI2 are set to Auto mode, and AI3 and AI4 to O/S.

NOTE

The CHANNEL of unused blocks are recommended to set to '3' (SECONDARY_VALUE).

CHANNEL
Selects the input to the AI block from the transducer. The table below shows the input value depending on the setting of CHANNEL. Set CHANNEL according to the value you want to input to the AI block.

Table 5.17 Input Selected by CHANNEL Setting

CHANNEL Setting	Input Selected
1	Sensor 1 input (PRIMARY_VALUE_1)
2	Sensor 2 input (PRIMARY_VALUE_2)
3	Terminal board temperature (SECONDARY_VALUE)
4	Temperature difference between sensors 1 and 2 (DIFFERENTIAL_VALUE)
5	Average temperature of sensors 1 and 2 (AVERAGE_VALUE)
6	Backup temperature (BACKUP_VALUE)

XD_SCALE
Stipulates the range of the input from the transducer. The customer-specified range (or the default range if the range was not specified when ordering) is set before the YTA320 is shipped from the factory.
If the unit of the input temperature value is set as mV or ohm in the transducer block and the unit of XD_SCALE is set as a unit of temperature (e.g., °C), or vice versa, the status becomes Uncertain or Bad. It is recommended to set the same unit for the transducer block and AO blocks.

L_TYPE
Stipulates the calculation in the AI block.
Setting L_TYPE to:

- "Direct" puts the value that is input to CHANNEL, in OUT as is.
- "Indirect" performs scaling of the input value based on XD_SCALE and OUT_SCALE and puts the scaled value in OUT.
- "IndirectSQRT" performs scaling of the input value based on XD_SCALE, extracts the square root of the scaled value, performs scaling of the square root, and then puts the scaled value in OUT.

PV_FTIME
Stipulates the time constant (in seconds) of the first-order lag filter inside the AI block.

OUT_SCALE
Stipulates the range of OUT (by setting the upper and lower range limits). The unit can also be set freely. OUT_SCALE is set to 0 to 100% before the YTA320 is shipped from the factory. Change the setting as necessary.

Alarm Priorities: HI_HI_PRI, HI_PRI, LO_PRI, and LO_LO_PRI
These parameters determine the respective priority levels of the four types of process alarms: HI_HI_ALM, HI_ALM, LO_ALM, and LO_LO_ALM. Only the alarms whose priority level is set to 3 or higher will be transmitted upon occurrence.
These parameters are set to 1 before the YTA320 is shipped from the factory.

Table 5.18 Alarm Priority

Value	Descriptions
0	Alart is not notified. Alarm parameters are not updated.
1	Alart is not notified.
3 to 7	Advisory alarms.
8 to 15	Critical alarms.

Alarm Thresholds: HI_HI_LIM, HI_LIM, LO_LIM, and LO_LO_LIM
These parameters determine the respective thresholds for the four types of process alarms: HI_HI_ALM, HI_ALM, LO_ALM, and LO_LO_ALM. Before the YTA320 is shipped from the factory, these parameters are set to values such that no alarm will occur.

5.6.6 Parameters of DI Function Block

Parameters of function blocks can be read and written from a host computer. See Appendix 1 for a list of all parameters of the YTA320. This section describes only the settings for important parameters of each DI block.

MODE_BLK
Supports O/S, Auto, and Manual modes. The DI block does not function in the O/S mode, does not update the measured value in the Manual mode, and updates the measured value in the Auto mode. Normally, set the mode to Auto. Before the YTA320 is shipped from the factory, all the DI blocks are set to O/S mode.

CHANNEL
Selects the input to the DI block from the transducer. The table below shows the input value depending on the setting of CHANNEL. Set CHANNEL according to the value you want to input to the DI block.

Table 5.19 Input Selected by CHANNEL Setting

CHANNEL Setting	Input Selected
7	Limit switch 1
8	Limit switch 2
9	Limit switch 3
10	Limit switch 4

PV_FTIME
Stipulates the delay time (in seconds) of changing the output value after a change of the value inside the DI block.

DISC_PRI
Determines the priority level of the discrete alarm on the block's output (OUT_D). The alarm will be transmitted upon occurrence only when the DISC_PRI is set at 3 or higher. This parameter is set to 1 before the YTA320 is shipped from the factory.

Table 5.20 Alarm Priority

Value	Descriptions
0	Alart is not notified. Alarm parameters are not updated.
1	Alart is not notified.
3 to 7	Advisory alarms.
8 to 15	Critical alarms.

DISC_LIM
Setpoint of the discrete alarm; when the value of OUT_D agrees with the value set in DISC_LIM, the discrete alarm is generated.

5.6.7 A setting when Sensor input 2 is not connected

When Sensor input 2 is not connected, set parameters as below.

- **SENSOR_TYPE_2 (Transducer Block)**
  Select "Non Connection".
- **LIMSW_1(2 to 4)_TARGET (Transducer Block)**
  Select "PRIMARY_VALUE_1" or "SECONDARY_VALUE".
- **CHANNEL (AI1 to AI4 function Block)**
  Set "1" or "3". "1" means PRIMARY_VALUE_1 and "3" means SECONDARY_VALUE.

6. In-process Operation

6.1 Mode Transition

All function blocks have modes. All blocks have their mode, expressed by MODE_BLK parameter. It is a structure of four components; Target, Actual, Permitted and Normal.

Target : Sets the operating condition of the block.
Actual : Indicates the current operating condition.
Permit : Indicates the operating condition that the block is allowed to take.
Normal: Indicates the operating condition that the block will usuall y take.

When necessary condition is satisfied, actual mode becomes same to target. There is a chance that actual mode says different from target by some reason.

When the function block mode is changed to Out_ Of_Service (O/S), the function block pauses and a block alarm is issued. When the function block mode is changed to Manual (Man), the function block suspends updating of output values. In this case alone, it is possible to write a value to the OUT parameter of the block for output. Note that no parameter status can be changed.

6.2 Generation of Alarm

6.2.1 Indication of Alarm

When the self-diagnostics function indicates that a device is faulty, an alarm (device alarm) is issued from the resource block. When an error (block error) is detected in each function block or an error in the process value (process alarm) is detected, an alarm is issued from each block. If an LCD indicator is installed, the error number is displayed as AL XXX. If two or more alarms are issued, multiple error numbers are displayed in 2-second intervals.

For details of errors, refer to Chapter 7.

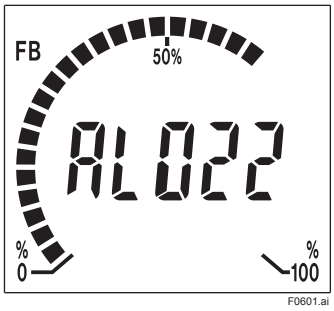


Figure 6.1 Error Identification on Indicator

6.2.2 Alarms and Events

Following alarm or event can be reported by YTA as an alert if allowed.

Analog Alerts
(Generated when a process value exceeds threshold)

By AI Block	Hi-Hi Alarm, Hi Alarm, Low Alarm, Low-Low Alarm

Discrets Alerts
(Generated when an abnormal condition is detected)

By Resource Block	Block Alarm, Write Alarm
By Transducer Block	Block Alarm
By AI Block	Block Alarm
By DI Block	Block Alarm

Update Alerts
(Generated when a important (restorable) parameter is updated)

By Resource Block	Update Event
By Transducer Block	Update Event
By AI Block	Update Event
By AI Block	Update Event

An alert has following structure:

Table 6.1 Alert Object

Subindex			Parameter Name	Explanation
Analog Alert	Discrete Alert	Update Alert		
1	1	1	Block Index	Index of block from which alert is generated
2	2	2	Alert Key	Alert Key copied from the block
3	3	3	Standard Type	Type of the alert
4	4	4	Mfr Type	Alert Name identified by manufacturer specific DD
5	5	5	Message Type	Reason of alert notification
6	6	6	Priority	Priority of the alarm
7	7	7	Time Stamp	Time when this alert is first detected
8	8		Subcode	Enumerated cause of this alert
9	9		Value	Value of referenced data
10	10		Relative Index	Relative index of referenced data
		8	Static Revision	Value of static revision (ST_REV) of the block
11	11	9	Unit Index	Unit code of referenced data

6.3 Simulation Function

The simulation function simulates the input of a function block and lets it operate as if the data was received from the transducer block. It is possible to conduct testing for the downstream function blocks or alarm processes.

A SIMULATE_ENABLE switch is mounted in the YTA amplifier. This is to prevent the accidental operation of this function. When this is switched on, simulation is enabled. (See Figure 6.2.) To initiate the same action from a remote terminal, if REMOTE LOOP TEST SWITCH (Note: in capital letter) is written to the SIM_ENABLE_MSG parameter (index 1044) of the resource block, the resulting action is the same as is taken when the above switch is on. Note that this parameter value is lost when the power is turned OFF. In simulation enabled status, an alarm is generated from the resource block, and other device alarms will be masked; for this reason the simulation must be disabled immediately after using this function.

The SIMULATE parameter of AI block consists of the elements listed in Table 6.2 below.

Table 6.2 SIMULATE(_D) Parameter

Subindex	Parameters	Description
1	Simulate Status	Sets the data status to be simulated.
2	Simulate Value	Sets the value of the data to be simulated.
3	Transducer Status	Displays the data status from the transducer block. It cannot be changed.
4	Transducer Value	Displays the data value from the transducer block. It cannot be changed.
5	Simulate En/Disable	Controls the simulation function of this block. 1: Simulation disabled (standard) 2: Simulation started

When Simulate En/Disable in Table 6.2 above is set to 2, the applicable function block uses the simulation value set in this parameter instead of the data from the transducer block. This setting can be used for propagation of the status to the trailing blocks, generation of a process alarm, and as an operation test for trailing blocks.

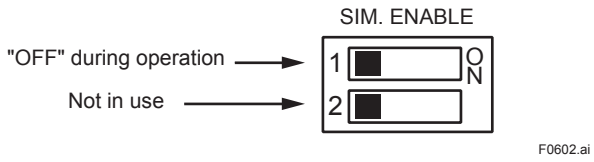


Figure 6.2 SIMULATE_ENABLE Switch Position

6.4 Operation of Integral Indicator

If integral indicator is specified, the LCD display which can diplay output value of each AI block, address and error codes is installed with the instrument. Items to be displayed can be selected in Transducer block parameters. (Refer to section 5.6.4.)

NOTE

Though the DISPLAY_WARNING parameter is set to "SHOW", code for warning will not be shown if the warning function is disabled by parameters WARNING_ENABLE _# in Transducer block.

Following figure shows the items shown on a display.

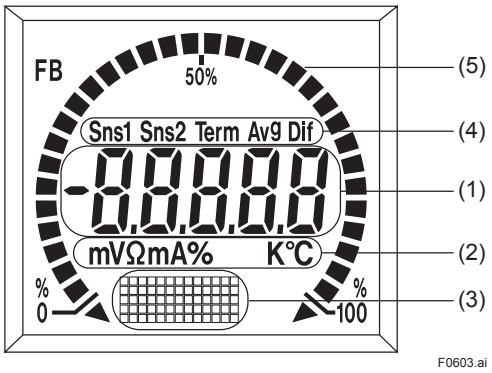


Figure 6.3 LCD Display

Five-digit LCD Display (1)

Shows Output value(OUT) of AI block, Address, and Error Codes(AL XXX). Shows "-----" when the communication has not been established, for example immediately after power on, or when AI block is not scheduled.

Unit Display (2)

Unit of OUT value displayed on the Five-digit LCD.

Dot-matrix Display (3)

Shows name of the AI block whose OUT value is displayed on the five-digit display(AI1, AI2, AI3, AI4) and status of the OUT signal(Good, Bad, Uncertain). Shows 'Stop' when the communication has not been established, for example immediately after power on, or when AI block is not scheduled. Shows 'FAIL'. when a hardware error is detected,

Signal type diplay (4)

Shows the type of the signal which is assigened for AI block. (Sensor1, Sensor2, Terminal Temperature, Average, Differential). For Sensor back-up value, shows the sensor which is used as current input value.

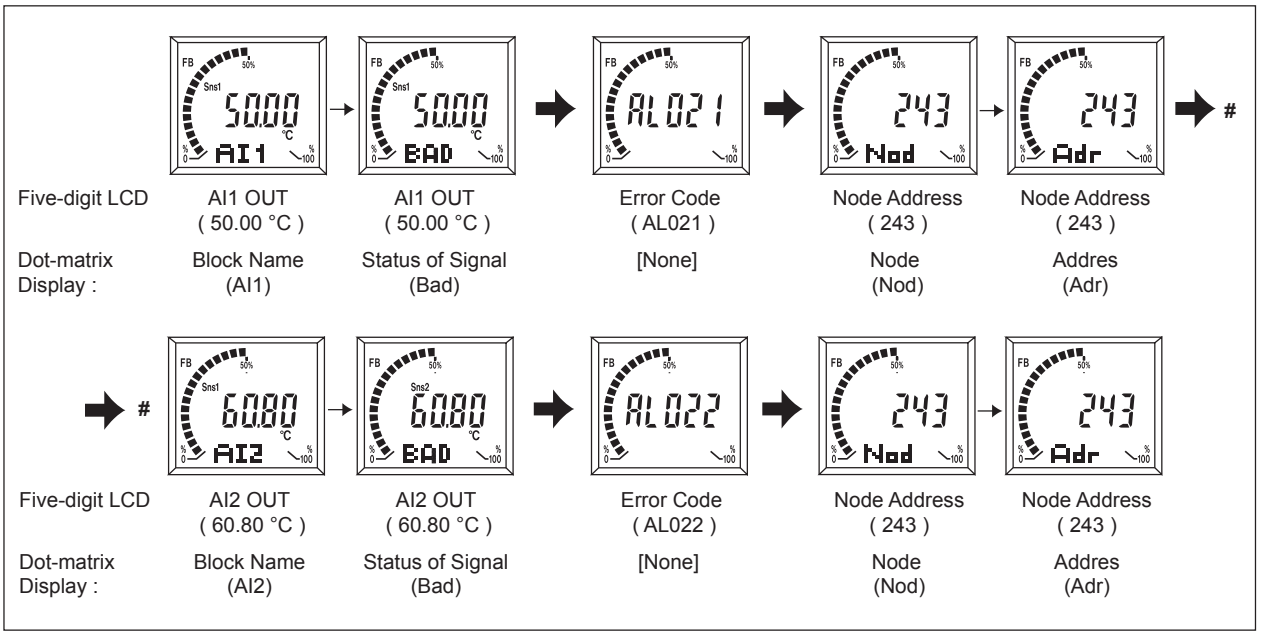
Bar-graph (5)

Always shows output value(OUT) of AI1.

Items are shown in cyclic way. An example of display is shown below.

[Overview]
In the example below, parameters are set as shown in the box in the right.
As the transducer block and the resource block are currently in O/S mode, error codes 'AL021' and 'AL022' are shown in turn, and the status of OUT for both AI1 and AI2 appears as 'Bad'. If the status of OUT is 'good', 'G.D' is shown in place. If it is 'uncertain', 'UnC' is displayed.

Parameters in Transducer block
DISPLAY_AI_OUT = AI1, AI2
DISPLAY_ERROR = SHOW
DISPLAY_WARNING = INHIBIT
DISPLAY_ADDR = SHOW
CHANNEL of AI1, AI2 block
CHANNEL of AI1 = 1 (Sensor1)
CHANNEL of AI2 = 2 (Sensor2)



F0604.ai

Figure 6.4 Display Example

7. Errors and Warnings

7.1 Error and Warning Indications

Faults found as a result of self-diagnostics by a YTA320 are identified as errors or warnings. Errors are abnormalities in the physical device, such as a hardware failure or communication error. Warnings are problems in the parameter settings or abnormal operation status of the device, such as the active state of the bypass action and simulation mode, in order to alert the user. The user can check the errors and warnings currently occurring in a YTA320 with either of the following:

- Value (bit statuses) in DEVICE_STATUS_1 to _8 of the resource block
- Error code displayed on the LCD (for a model with a built-in LCD)

7.2 Checking with LCD

For a YTA320 with a built-in LCD, when an error or warning occurs, the corresponding code is displayed on the LCD. Codes AL001 to AL085 indicate errors, and AL100 and later indicate warnings. The following shows the code, indication, cause, and remedy for each of the errors and warnings. Warnings and errors can be masked independently by the user if desired (see Section 5.6.4).

Table 7.1 Errors

Code Displayed on LCD	Indication of DEVICE_ STATUS_#	Cause	Remedy
- - -	—	YTA does not participate in the network.	Check the communication related parameters. See A.5.2 for details.
		The AI block to be displayed on the LCD is not yet scheduled.	Check the setting of DISPLAY_AI_OUT in TB block.
AL001	No Response From AD Board	Failure in input circuitry of hardware	Make a service call.
AL003	EEPROM failure	EEPROM failure	Make a service call.
AL004	Flash ROM SUM Error	Flash ROM failure	Make a service call.
AL005	PPM Communication Error	Internal communication error	Make a service call.
AL006	Parsley Receive Error	Internal communication error	Make a service call.
AL007	AMP Temp Counter Too High	Hardware failure	Make a service call.
AL008	AMP Temp Counter Too Low	Hardware failure	Make a service call.
AL010	WDT 3 Times Over Error	Hardware failure	Make a service call.
AL021	RB in O/S Mode	The actual mode of the resource block is O/S.	Set the target mode of the resource block to Auto.
AL022	TB in O/S Mode	The actual mode of the transducer block is O/S.	Set the target mode of the transducer block to Auto.
AL030	Start Backup Mode of Channel6	The backup sensor input is selected for channel 6.	Restore the sensor 1 input to normal. Then, set 1 (Enable) in BACKUP_ RETURN_SENSOR1, or turn off the power once and back on again.
AL031	Not Used Sensor1	Although a channel number related to sensor 1 (see note) is assigned to an AI or DI block, SENSOR_TYPE_1 is set to Non-connection.	Do not assign to any AI or DI block a channel number related to sensor 1 (see note) when the sensor 1 input is not used. When using the sensor 1 input, set SENSOR_TYPE_1 correctly.

Code Displayed on LCD	Indication of DEVICE_ STATUS_#	Cause	Remedy
AL032	Not Used Sensor2	Although a channel number related to sensor 2 (see note) is assigned to an AI or DI block, SENSOR_TYPE_2 is set to Non-connection.	Do not assign to any AI or DI block a channel number related to sensor 2 (see note) when the sensor 2 input is not used. When using the sensor 2 input, set SENSOR_TYPE_2 correctly.
AL033	Cannot Use Sensor2	Although the type of sensor 1 is defined as a 4-wire sensor, the type of sensor 2 is defined as a type other than Non-connection.	Set SENSOR_TYPE_2 to Non-connection or change the type of sensor 1 to 3- or 2-wire sensor.
AL034	Illegal Sensor Type Combination	The differential, average, or backup temperature is assigned to an AI block, or a limit switch for which the target value is the differential, average, or backup temperature is assigned to a DI block; however, the type of one sensor input is a temperature sensor but the other is mV or Ohm.	When using the differential, average, or backup temperature, set the types of both sensors 1 and 2 to temperature sensors, or mV, or Ohm. In other cases, do not assign the channel number of the differential, average, or backup temperature to any AI block or to the target value of a limit switch you use.
AL040	Sensor1 Failure	There is a breakage in sensor 1, or sensor 1 is disconnected from the terminals.	In sensor failure, status of the related signal turns to Bad and the value stays the value of the former cycle immediately before. Check whether the sensor is connected correctly. When the sensor backup temperature is used, see the remedy for AL030.
AL041	Sensor1 Signal Error	The temperature read by sensor 1 widely exceeds the measurable temperature range of the sensor.	Check whether the sensor is connected correctly. Check whether the sensor type is correctly set.
AL050	Sensor2 Failure	There is a breakage in sensor 2, or sensor 2 is disconnected from the terminals.	In sensor failure, status of the related signal turns to Bad and the value stays the value of the former cycle immediately before.Check whether the sensor is connected correctly. When the sensor backup temperature is used, see the remedy for AL030.
AL051	Sensor2 Signal Error	The temperature read by sensor 2 widely exceeds the measurable temperature range of the sensor.	Check whether the sensor is connected correctly. Check whether the sensor type is correctly set.
AL060	Terminal Sensor Failure	The sensor built into the terminal board has failed.	Make a service call.
AL061	Terminal Temp Too High	The terminal board temperature is higher than the specified high limit.	Keep the heat source away or change the installation position to a place where the ambient temperature is cooler.
AL062	Terminal Temp Too Low	The terminal board temperature is lower than the specified low limit.	Provide a heater or the like to increase the ambient temperature or change the installation position to a place where the ambient temperature is warmer.

Note: For an AI block, channel numbers related to sensor 1 are as follows:
1 (PRIMARY_VALUE_1), 4 (DIFFERENTIAL_VALUE), 5 (AVERAGE_VALUE), 6 (BACKUP_VALUE)
For a DI block, the numbers mean the channels corresponding to the limit switches for which the target value (LIMSW_#_TARGET) is set to any one of the following:
PRIMARY_VALUE_1, DIFFERENTIAL_VALUE, AVERAGE_VALUE, BACKUP_VALUE
For example, if PRIMARY_VALUE_1 is set for LIMSW_1_TARGET, channel 7 is a channel related to sensor 1. The same applies to the channel numbers related to sensor 2.

Table 7.2 Warnings

Code Displayed on LCD	Indication of DEVICE_ STATUS_#	Cause	Remedy
AL100	AI1 in O/S mode	The actual mode of the AI1 block is O/S.	See Table 7.3.
AL101	AI1 in MAN mode	The actual mode of the AI1 block is Man.	Set the target mode of AI1 to Auto.
AL102	AI1 in Simulate Active	SIMULATE of the AI1 block is Active.	Set SIMULATE of AI1 to Disabled.
AL103	AI1 Non-Scheduled	Execution of AI1 is not scheduled.	Include AI1 in the schedule (by setting FB_START_ENTRY.#.)
AL104	AI2 in O/S mode	The actual mode of the AI2 block is O/S.	See Table 7.3.
AL105	AI2 in MAN mode	The actual mode of the AI2 block is Man.	Set the target mode of AI2 to Auto.
AL106	AI2 in Simulate active	SIMULATE of the AI2 block is Active.	Set SIMULATE of AI2 to Disabled.
AL108	AI3 in O/S mode	The actual mode of the AI3 block is O/S.	See Table 7.3.
AL109	AI3 in MAN mode	The actual mode of the AI3 block is Man.	Set the target mode of AI3 to Auto.
AL110	AI3 in Simulate active	SIMULATE of the AI3 block is Active.	Set SIMULATE of AI3 to Disabled.
AL112	AI4 in O/S mode	The actual mode of the AI4 block is O/S.	See Table 7.3.
AL113	AI4 in MAN mode	The actual mode of the AI4 block is Man.	Set the target mode of AI4 to Auto.
AL114	AI4 in Simulate active	SIMULATE of the AI4 block is Active.	Set SIMULATE of AI4 to Disabled.
AL116	DI1 in O/S mode	The actual mode of the DI1 block is O/S.	See Table 7.3.
AL117	DI1 in MAN mode	The actual mode of the DI1 block is Man.	Set the target mode of DI1 to Auto.
AL118	DI1 in Simulate active	SIMULATE_D of the DI1 block is Active.	Set SIMULATE_D of DI1 to Disabled.
AL120	DI2 in O/S mode	The actual mode of the DI2 block is O/S.	See Table 7.3.
AL121	DI2 in MAN mode	The actual mode of the DI2 block is Man.	Set the target mode of DI2 to Auto.
AL122	DI2 in Simulate active	SIMULATE_D of the DI2 block is Active.	Set SIMULATE_D of DI2 to Disabled.
AL124	DI3 in O/S mode	The actual mode of the DI3 block is O/S.	See Table 7.3.
AL125	DI3 in MAN_mode	The actual mode of the DI3 block is Man.	Set the target mode of DI3 to Auto.
AL126	DI3 in Simulate active	SIMULATE_D of the DI3 block is Active.	Set SIMULATE_D of DI3 to Disabled.
AL128	DI4 in O/S mode	The actual mode of the DI4 block is O/S.	See Table 7.3.
AL129	DI4 in MAN mode	The actual mode of the DI4 block is Man.	Set the target mode of DI4 to Auto.
AL130	DI4 in Simulate active	SIMULATE_D of the DI4 block is Active.	Set SIMULATE_D of DI4 to Disabled.
AL132	PID1 in O/S	The actual mode of the PID1 block is O/S.	See Table 7.3.
AL140	PID1 in Bypass active	The bypass action for PID1 is active.	Reset BYPASS of PID1 to off.
AL142	PID2 in O/S mode	The actual mode of the PID2 block is O/S.	See Table 7.3.

Code Displayed on LCD	Indication of DEVICE_ STATUS_#	Cause	Remedy
AL150	PID2 in Bypass active	The bypass action for PID2 is active.	Reset BYPASS of PID2 to off.
AL160	Sensor1 Temp Too High	The temperature read by sensor 1 is higher than the specified high limit.\	Check the adequacy of the measurement temperature range and use the appropriate sensor type.
AL161	Sensor1 Temp Too Low	The temperature read by sensor 1 is lower than the specified low limit.	Check the adequacy of the measurement temperature range and use the appropriate sensor type.
AL170	Sensor2 Temp Too High	The temperature read by sensor 2 is higher than the specified high limit.	Check the adequacy of the measurement temperature range and use the appropriate sensor type.
AL171	Sensor2 Temp Too Low	The temperature read by sensor 2 is lower than the specified low limit.	Check the adequacy of the measurement temperature range and use the appropriate sensor type.
AL190	Stop Detection of Sensor Burnout	Sensor burnout detection has been stopped, and therefore a sensor failure cannot be detected.	Set SENSOR_BURNOUT_DETECT to 0 (on).
AL191	Illegal Unit of AI1	The unit setting in XD_SCALE of the AI1 block is illegal.	Correct the unit setting in XD_SCALE of AI1 so that it matches the sensor type of the input chosen for CHANNEL.
AL192	Illegal Unit of AI2	The unit setting in XD_SCALE of the AI2 block is illegal.	Correct the unit setting in XD_SCALE of AI2 so that it matches the sensor type of the input chosen for CHANNEL.
AL193	Illegal Unit of AI3	The unit setting in XD_SCALE of the AI3 block is illegal.	Correct the unit setting in XD_SCALE of AI3 so that it matches the sensor type of the input chosen for CHANNEL.
AL194	Illegal Unit of AI4	The unit setting in XD_SCALE of the AI4 block is illegal.	Correct the unit setting in XD_SCALE of AI4 so that it matches the sensor type of the input chosen for CHANNEL.
AL198	Default Address Mode	The physical address is left as the default.	Set the operable address.

Table 7.3 Troubleshooting When Actual in MODE_BLK of a Function Block Cannot Change from O/S

Presumed Cause	Remedy
The target mode of the function block in question is not set.	Set the target mode of the block to Auto.
The actual mode of the resource block is O/S.	Set the target mode of the resource block to Auto.
Function block execution schedule is not set correctly.	Set up the schedule using a configuration tool or the like.

7.3 Checking with DEVICE_STATUS_1 to _8 of Resource Block

When faults occur, the corresponding bits in the parameters DEVICE_STATUS_1 to _8 of the resource block are set to on. Table 7.4 shows the codes and indications corresponding to the individual bits in DEVICE_STATUS_1 as well as the meanings represented. Tables 7.5 to 7.10 show the codes and indications corresponding to the individual bits in DEVICE_STATUS_2 to _3 and _5 to _8. The codes shown in these tables are identical to those shown in the preceding section. Hence, see Tables 7.1 and 7.2 for the causes and remedies.

Table 7.4 Contents of DEVICE_STATUS_1

Hexadecimal Indication	Indication When Device Description Has Been Installed	Corresponding Error/Warning Code	Meaning
0x8000 0000			
0x4000 0000			
0x2000 0000			
0x1000 0000			
0x0800 0000			
0x0400 0000			
0x0200 0000			
0x0100 0000			
0x0080 0000	Sim.enable Jmpr On		The SIM.ENABLE switch on the amplifier is ON.
0x0040 0000	RB in O/S mode	AL021	The resource block is in O/S mode.
0x0020 0000			
0x0010 0000			
0x0008 0000	EEPROM failure	AL003	EEPROM failure
0x0004 0000			
0x0002 0000			
0x0001 0000			
0x0000 8000	Link Obj.1/17 not open		The Virtual Communications Relationship (VCR) to which link object 1 or 17 is specified to be linked is not open.
0x0000 4000	Link Obj.2/18 not open		The Virtual Communications Relationship (VCR) to which link object 2 or 18 is specified to be linked is not open.
0x0000 2000	Link Obj.3/19 not open		The Virtual Communications Relationship (VCR) to which link object 3 or 19 is specified to be linked is not open.
0x0000 1000	Link Obj.4/20 not open		The Virtual Communications Relationship (VCR) to which link object 4 or 20 is specified to be linked is not open.
0x0000 0800	Link Obj.5/21 not open		The Virtual Communications Relationship (VCR) to which link object 5 or 21 is specified to be linked is not open.
0x0000 0400	Link Obj.6/22 not open		The Virtual Communications Relationship (VCR) to which link object 6 or 22 is specified to be linked is not open.
0x0000 0200	Link Obj.7/23 not open		The Virtual Communications Relationship (VCR) to which link object 7 or 23 is specified to be linked is not open.
0x0000 0100	Link Obj.8/24 not open		The Virtual Communications Relationship (VCR) to which link object 8 or 24 is specified to be linked is not open.
0x0000 0080	Link Obj.9/25 not open		The Virtual Communications Relationship (VCR) to which link object 9 or 25 is specified to be linked is not open.
0x0000 0040	Link Obj.10/26 not open		The Virtual Communications Relationship (VCR) to which link object 10 or 26 is specified to be linked is not open.
0x0000 0020	Link Obj.11 not open		The Virtual Communications Relationship (VCR) to which link object 11 is specified to be linked is not open.
0x0000 0010	Link Obj.12 not open		The Virtual Communications Relationship (VCR) to which link object 12 is specified to be linked is not open.
0x0000 0008	Link Obj.13 not open		The Virtual Communications Relationship (VCR) to which link object 13 is specified to be linked is not open.
0x0000 0004	Link Obj.14 not open		The Virtual Communications Relationship (VCR) to which link object 14 is specified to be linked is not open.
0x0000 0002	Link Obj.15 not open		The Virtual Communications Relationship (VCR) to which link object 15 is specified to be linked is not open.
0x0000 0001	Link Obj.16 not open		The Virtual Communications Relationship (VCR) to which link object 16 is specified to be linked is not open.

Table 7.5 Contents of DEVICE_STATUS_2

Hexadecimal Indication	Indication When Device Description Has Been Installed	Corresponding Error/Warning Code
0x8000 0000		
0x4000 0000	No Response From A/D Board	AL001
0x2000 0000		
0x1000 0000	Flash ROM SUM Error	AL004
0x0800 0000	PPM Communication Error	AL005
0x0400 0000	Parsley Receive Error	AL006
0x0200 0000		
0x0100 0000	AMP Temp Counter Too High	AL007
0x0080 0000	AMP Temp Counter Too Low	AL008
0x0040 0000		
0x0020 0000	WDT 3 Time Over Error	AL010
0x0010 0000		
0x0008 0000		
0x0004 0000		
0x0002 0000		
0x0001 0000	TB in O/S mode	AL022
0x0000 8000		
0x0000 4000		
0x0000 2000		
0x0000 1000		
0x0000 0800		
0x0000 0400		
0x0000 0200		
0x0000 0100	Start Backup Mode of Channel 6	AL030
0x0000 0080	Not Used Sensor 1	AL031
0x0000 0040	Not Used Sensor 2	AL032
0x0000 0020	Cannot Use Sensor 2	AL033
0x0000 0010	Illegal Sensor Type Combination	AL034
0x0000 0008		
0x0000 0004		
0x0000 0002		
0x0000 0001		

Table 7.6 Contents of DEVICE_STATUS_3

Hexadecimal Indication	Indication When Device Description Has Been Installed	Corresponding Error/Warning Code
0x8000 0000		
0x4000 0000	Sensor 1 Failure	AL040
0x2000 0000	Sensor 1 Signal Error	AL041
0x1000 0000		
0x0800 0000		
0x0400 0000		
0x0200 0000		
0x0100 0000	Sensor 2 Failure	AL050
0x0080 0000	Sensor 2 Signal Error	AL051
0x0040 0000		
0x0020 0000		
0x0010 0000		
0x0008 0000		
0x0004 0000	Terminal Sensor Failure	AL060
0x0002 0000	Terminal Temp Too High	AL061
0x0001 0000	Terminal Temp Too Low	AL062
0x0000 8000		
0x0000 4000		
0x0000 2000		
0x0000 1000		
0x0000 0800		
0x0000 0400		
0x0000 0200		
0x0000 0100		
0x0000 0080		
0x0000 0040		
0x0000 0020		
0x0000 0010		
0x0000 0008		
0x0000 0004		
0x0000 0002		
0x0000 0001		

Table 7.7 Contents of DEVICE_STATUS_5

Hexadecimal Indication	Indication When Device Description Has Been Installed	Corresponding Error/Warning Code
0x8000 0000		
0x4000 0000	AI1 in O/S mode	AL100
0x2000 0000	AI1 in MAN mode	AL101
0x1000 0000	AI1 in Simulate active	AL102
0x0800 0000	AI1 Non-Scheduled	AL103
0x0400 0000	AI2 in O/S mode	AL104
0x0200 0000	AI2 in MAN mode	AL105
0x0100 0000	AI2 in Simulate active	AL106
0x0080 0000		
0x0040 0000	AI3 in O/S mode	AL108
0x0020 0000	AI3 in MAN mode	AL109
0x0010 0000	AI3 in Simulate active	AL110
0x0008 0000		
0x0004 0000	AI4 in O/S mode	AL112
0x0002 0000	AI4 in MAN mode	AL113
0x0001 0000	AI4 in Simulate active	AL114
0x0000 8000		
0x0000 4000	DI1 in O/S mode	AL116
0x0000 2000	DI1 in MAN mode	AL117
0x0000 1000	DI1 in Simulate active	AL118
0x0000 0800		
0x0000 0400	DI2 in O/S mode	AL120
0x0000 0200	DI2 in MAN mode	AL121
0x0000 0100	DI2 in Simulate active	AL122
0x0000 0080		
0x0000 0040	DI3 in O/S mode	AL124
0x0000 0020	DI3 in MAN mode	AL125
0x0000 0010	DI3 in Simulate active	AL126
0x0000 0008		
0x0000 0004	DI4 in O/S mode	AL128
0x0000 0002	DI4 in MAN mode	AL129
0x0000 0001	DI4 in Simulate active	AL130

Table 7.8 Contents of DEVICE_STATUS_6

Hexadecimal Indication	IIndication When Device Description Has Been Installed	Corresponding Error/Warning Code
0x8000 0000		
0x4000 0000		
0x2000 0000	PID1 in O/S mode	AL132
0x1000 0000		
0x0800 0000		
0x0400 0000		
0x0200 0000		
0x0100 0000		
0x0080 0000		
0x0040 0000		
0x0020 0000	PID1 in Bypass active	AL140
0x0010 0000		
0x0008 0000	PID2 in O/S mode	AL142
0x0004 0000		
0x0002 0000		
0x0001 0000		
0x0000 8000		
0x0000 4000		
0x0000 2000		
0x0000 1000		
0x0000 0800	PID2 in Bypass active	AL150
0x0000 0400		
0x0000 0200		
0x0000 0100		
0x0000 0080		
0x0000 0040		
0x0000 0020		
0x0000 0010		
0x0000 0008		
0x0000 0004		
0x0000 0002		
0x0000 0001		

Table 7.9 Contents of DEVICE_STATUS_7

Hexadecimal Indication	Indication When Device Description Has Been Installed	Corresponding Error/Warning Code
0x8000 0000		
0x4000 0000	Sensor1 Temp Too High	AL160
0x2000 0000	Sensor1 Temp Too Low	AL161
0x1000 0000		
0x0800 0000		
0x0400 0000		
0x0200 0000		
0x0100 0000		
0x0080 0000		
0x0040 0000	Sensor2 Temp Too High	AL170
0x0020 0000	Sensor2 Temp Too Low	AL171
0x0010 0000		
0x0008 0000		
0x0004 0000		
0x0002 0000		
0x0001 0000		
0x0000 8000		
0x0000 4000		
0x0000 2000		
0x0000 1000		
0x0000 0800		
0x0000 0400		
0x0000 0200		
0x0000 0100		
0x0000 0080		
0x0000 0040		
0x0000 0020		
0x0000 0010		
0x0000 0008		
0x0000 0004		
0x0000 0002		
0x0000 0001		

Table 7.10 Contents of DEVICE_STATUS_8

Hexadecimal Indication	Indication When Device Description Has Been Installed	Corresponding Error/Warning Code
0x8000 0000		
0x4000 0000	Stop Detection of Sensor Burnout	AL190
0x2000 0000	Illegal Unit of AI1	AL191
0x1000 0000	Illegal Unit of AI2	AL192
0x0800 0000	Illegal Unit of AI3	AL193
0x0400 0000	Illegal Unit of AI4	AL194
0x0200 0000		
0x0100 0000		
0x0080 0000		
0x0040 0000	Default Address Mode	AL198
0x0020 0000		
0x0010 0000		
0x0008 0000		
0x0004 0000		
0x0002 0000		
0x0001 0000		
0x0000 8000		
0x0000 4000		
0x0000 2000		
0x0000 1000		
0x0000 0800		
0x0000 0400		
0x0000 0200		
0x0000 0100		
0x0000 0080		
0x0000 0040		
0x0000 0020		
0x0000 0010		
0x0000 0008		
0x0000 0004		
0x0000 0002		
0x0000 0001		

7.4 Precautions on Warnings

If all types of warnings are enabled, warnings on undefined function blocks are also generated. For instance, if the AI4 block is in O/S mode even when the AI4 block is not used, a warning occurs. To avoid this, you can mask unnecessary types of warnings according to the application and device configurations (see also Section 5.6.4). Although it is possible to mask all warnings, it is recommended to enable and unmask types of warnings appropriately for the device configurations. The following shows examples of recommended masking settings.

Table 7.11 Example of Warning Masking Settings

Case	Device Configurations	WARNING_ ENABLE_1	WARNING_ ENABLE_2	WARNING_ ENABLE_3	WARNING_ ENABLE_4
1	Sensor 2 is not used. Only AI1 is used.	0x7800 0000	0x0000 0000	0x6000 0000	0x2000 0000
2	Sensors 1 and 2 are used. AI1 and AI2 are used.	0x7f00 0000	0x0000 0000	0x6060 0000	0x3000 0000
3	Sensors 1 and 2 are used. AI1 and DI1 are used.	0x7800 7000	0x0000 0000	0x6060 0000	0x2000 0000

Table 7.12 Types of Warnings Displayed in Each of Cases 1 to 3

Parameter	Warning	Bit	Case 1	Case 2	Case 3
WARNING_ ENABLE_1	AI1 in O/S mode (AL100)	0x4000 0000	✓	✓	✓
	AI1 in MAN mode (AL101)	0x2000 0000	✓	✓	✓
	AI1 in Simulate active (AL102)	0x1000 0000	✓	✓	✓
	AI1 Non-Scheduled (AL103)	0x0800 0000	✓	✓	✓
	AI2 in O/S mode (AI104)	0x0400 0000		✓	
	AI2 in MAN mode (AL105)	0x0200 0000		✓	
	AI2 in Simulate active (AL106)	0x0100 0000		✓	
	AI3 in O/S mode (AL108)	0x0040 0000			
	AI3 in MAN mode (AI109)	0x0020 0000			
	AI3 in Simulate active (AL110)	0x0010 0000			
	AI4 in O/S mode (AL112)	0x0004 0000			
	AI4 in MAN mode (AI113)	0x0002 0000			
	AI4 in Simulate active (AL114)	0x0001 0000			
	DI1 in O/S mode (AL116)	0x0000 4000			✓
	DI1 in MAN mode (AL117)	0x0000 2000			✓
	DI1 in Simulae active (AL118)	0x0000 1000			✓
	DI2 in O/S mode (AL120)	0x0000 0400			
	DI2 in MAN mode (AL121)	0x0000 0200			
	DI2 in Simulate active (AL122)	0x0000 0100			
	DI3 in O/S mode (AL124)	0x0000 0040			
	DI3 in MAN mode (AL125)	0x0000 0020			
	DI3 in Simulate active (AL126)	0x0000 0010			
	DI4 in O/S mode (AL128)	0x0000 0004			
	DI4 in MAN mode (AL129)	0x0000 0002			
	DI4 in Simulate active (AL130)	0x0000 0001			
WARNING_ ENABLE_2	PID1 in O/S mode (AL132)	0x2000 0000			
	PID1 in Bypass active (AL140)	0x0020 0000			
	PID2 in O/S mode (AL142)	0x0008 0000			
	PID2 in Bypass active (AL150)	0x0000 0800			
WARNING_ ENABLE_3	Sensor1 Temp Too High (AL160)	0x4000 0000	✓	✓	✓
	Sensor1 Temp Too Low (AL161)	0x2000 0000	✓	✓	✓
	Sensor2 Temp Too High (AL170)	0x0040 0000		✓	✓
	Sensor2 Temp Too Low (AL171)	0x0020 0000		✓	✓
WARNING_ ENABLE_4	Stop Detection of Sensor Burnout (AL190)	0x4000 0000			
	Illegal Unit of AI1 (AL191)	0x2000 0000	✓	✓	✓
	Illegal Unit of AI2 (AL192)	0x1000 0000		✓	
	Illegal Unit of AI3 (AL193)	0x0800 0000			
	Illegal Unit of AI4 (AL194)	0x0400 0000			
	Default Address Mode (AL198)	0x0040 0000			

8. Handling Caution

This chapter describes important cautions regarding the installation of explosion protected type for FOUNDATION Fieldbus YTA transmitters. For JIS flameproof type, refer to IM 01C50B01-01E.

CAUTION

This instrument is tested and certified as intrinsically safe type or explosionproof type. Please note that the construction of the instrument, installation, external wiring, maintenance or repair is strictly restricted, and non-observance or negligence of these restriction would result dangerous condition.

WARNING

To preserve the safety of explosionproof equipment requires great care during mounting, wiring, and piping. Safety requirements also place restrictions on maintenance and repair activities. Please read the following sections very carefully.

8.1 Installation of Explosionproof Type Transmitters

8.1.1 CSA Certification

A) CSA Explosionproof Type

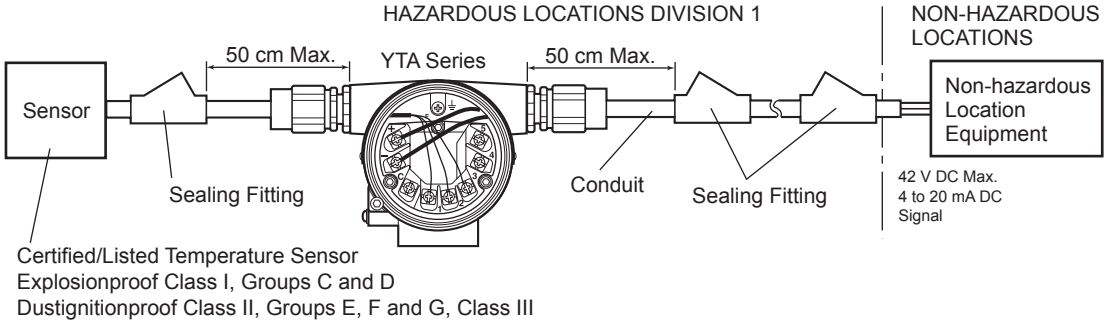
Caution for CSA Explosionproof type

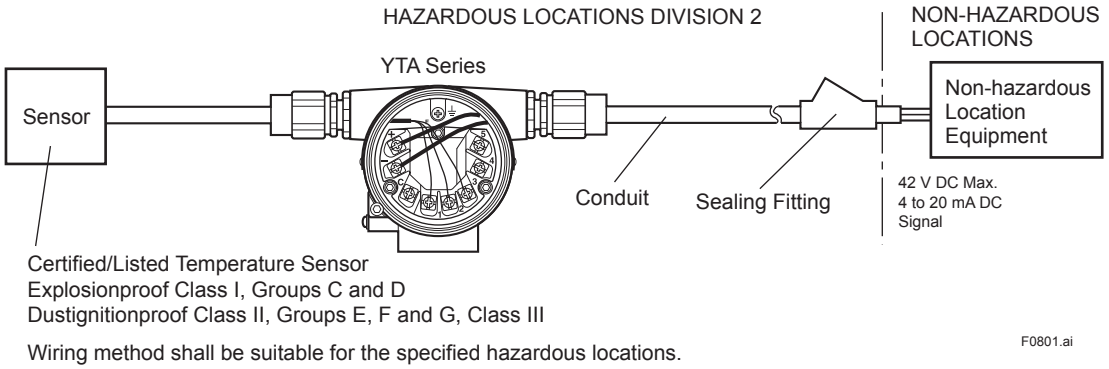
Note 1. YTA320-F/CF1 temperature transmitters are applicable for use in hazardous locations:

Certificate 1089576

[For CSA C22.2]

* Applicable Standard: C22.2 No.0, C22.2 No.0.4, C22.2 No.25, C22.2 No.30, C22.2 No.94, C22.2 No.142, C22.2 No.157, C22.2 No.213, C22.2 No.1010.1
* Explosionproof for Class I, Division 1, Groups B, C and D.
* Dust-ignitionproof for Class II, Groups E, F and G, Class III.
* Encl “Type 4X”
* Temperature Class: T6
* Ambient Temperature: –40 to 60°C
* Supply Voltage: 32 V dc max




HAZARDOUS LOCATIONS DIVISION 2
NON-HAZARDOUS LOCATIONS
YTA Series
Sensor
Conduit
Sealing Fitting
Non-hazardous Location Equipment
42 V DC Max.
4 to 20 mA DC Signal
Certified/Listed Temperature Sensor
Explosionproof Class I, Groups C and D
Dustignitionproof Class II, Groups E, F and G, Class III
Wiring method shall be suitable for the specified hazardous locations.

F0801.ai

Note 2. Wiring
* All wiring shall comply with Canadian Electrical Code Part I and Local Electrical Codes.
* In hazardous location, wiring shall be in conduit as shown in the figure.
* WARNING: A SEAL SHALL BE INSTALLED WITHIN 50 cm OF THE ENCLOSURE.
UN SCELLEMENT DOIT ÊTRE INSTALLÉ À MOINS DE 50 cm DU BOÎTIER.
* When installed in Division 2, "FACTORY SEALED, CONDUIT SEAL NOT REQUIRED".

Note 3. Operation
* Keep strictly the "WARNING" on the label attached on the transmitter.
WARNING: OPEN CIRCUIT BEFORE REMOVING COVER.
OUVRIR LE CIRCUIT AVANT D´ENLEVER LE COUVERCLE.
* Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous location.

Note 4. Maintenance and Repair
* The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void Canadian Standards Explosionproof Certification.

8.1.2 ATEX Certification

(1) Technical Data

A) ATEX Flameproof Type and Dust Ignition Proof Type

Caution for ATEX Flameproof Type and Dust Ignition Proof Type

Note 1. Model YTA320-F/KF2 temperature transmitters for potentially explosive atmospheres:
* No. KEMA 07ATEX0130
* Applicable Standard: EN 60079-0:2006, EN 60079-1:2007, EN 61241-0:2006, EN 61241-1:2004
* Type of Protection and Marking Code: II 2 G Ex d IIC T6/T5, II 2 D Ex tD A21 IP67 T70°C, T90°C
* Ambient Temperature for Gas Atmospheres:
–40 to 75°C (T6), –40 to 80°C (T5)
* Ambient Temperature for Dust Atmospheres:
–40 to 65°C (T70°C), –40 to 80°C (T90°C)
* Enclosure: IP67

Note 2. Electrical Data
* Supply voltage: 32 V dc max.
Output signal: 16.6 mA

Note 3. Installation
* All wiring shall comply with local installation requirement.
* The cable entry devices shall be of a certified flameproof type, suitable for the conditions of use.

Note 4. Operation
* Keep strictly the "WARNING" on the label on the transmitter.
WARNING: AFTER DE-ENERGIZING, DELAY 5 MINUTES BEFORE OPENING.
WHEN THE AMBIENT TEMP. ≥ 70°C, USE THE HEATRESISTING CABLES OF HIGHER THAN 90°C]
* Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous location.

Note 5. Maintenance and Repair
* The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void ATEX Flameproof Certification.

B) ATEX Intrinsically Safe "ia"

Caution for ATEX Intrinsically safe "ia".

Note 1. YTA Series temperature transmitters with optional code /KS25 for potentially explosive atmospheres:
* No. KEMA 02ATEX1324 X
* Applicable Standard: EN 50014:1997, EN 50020:2002, EN 50284:19999, EN 60529:1999

Note 2. Ratings
[Supply circuit]
• EEx ia IIC T4
Type of Protection and Marking Code: EEx ia IIC T4
Group: II
Category: 1G
Ambient Temperature: –40 to 60°C
Degree of Protection of the Enclosure: IP67
Electrical Data

* When combined with FISCO model IIC barrier
Ui = 17.5 V, Ii = 360 mA, Pi = 2.52 W,
Ci = 1.5 nF, Li = 8 µH
* When combined with barrier
Ui = 24.0 V, Ii = 250 mA, Pi = 1.2 W,
Ci = 1.5 nF, Li = 8 µH

• EEx ia IIB T4
Type of Protection and Marking Code:
EEx ia IIB T4
Group: II
Category: 1G
Ambient Temperature: –40 to 60°C
Degree of Protection of the Enclosure: IP67
Electrical Data
* When combined with FISCO model IIB barrier
Ui = 17.5 V, Ii = 380 mA, Pi = 5.32 W,
Ci = 1.5 nF, Li = 8 µH

[Sensor circuit]
Uo = 7.7 V, Io = 70 mA, Po = 140 mW,
Co = 1.6 µF, Li = 7.2 mH

• The above parameters apply when one of the two conditions below is given:
- the total Li of the external circuit (excluding the cable) is < 1% of the Lo value or
- the total Ci of the external circuit (excluding the cable) is < 1% of the Co value.

• The above parameters are reduced to 50% when both of the two conditions below are given:
- the total Li of the external circuit (excluding the cable) is ≥ 1% of the Lo value and
- the total Ci of the external circuit (excluding the cable) is ≥ 1% of the Co value.

• The reduced capacitance of the external circuit (including cable) shall not be greater than 1µF for Group IIB and 600nF for Group IIC.

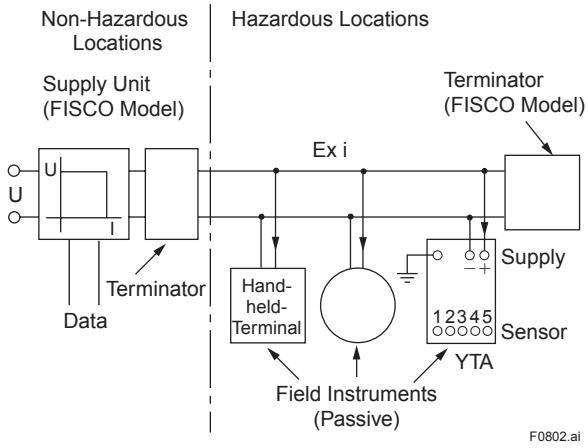
Note 3. Installation
* All wiring shall comply with local installation requirements. (Refer to the installation diagram)

Note 4. Maintenance and Repair
* The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void KEMA Intrinsically safe Certification.

Note 5. Special condition for safe use
* Because the enclosure of the Temperature Transmitter is made of aluminum, if it is mounted in an area where the use of category 1G apparatus is required, it must be installed such, that, even in the event of rare incidents, ignition source due to impact and friction sparks are excluded.

Note 6. Installation instructions
* From the safety point of view the circuit shall be considered to be connected to earth.
As this deviates from the FISCO system in accordance with IEC TS 60079-27 care has to be taken that the (local) installation requirements are taken into account as well.

(1) FISCO Model



I.S. fieldbus system complying with FISCO

The criterion for such interconnection is that the voltage (Ui), the current (Ii) and the power (Pi), which intrinsically safe apparatus can receive, must be equal or greater than the voltage (Uo), the current (Io) and the power (Po) which can be provided by the associated apparatus (supply unit). In addition, the maximum unprotected residual capacitance (Ci) and inductance (Li) of each apparatus (other than the terminators) connected to the fieldbus line must be equal or less than 5 nF and 10 µH respectively.

Supply unit

The supply unit must be certified by a notify body as FISCO model and following trapezoidal or rectangular output characteristic is used.
Uo = 14 . . . 24 V (I.S. maximum value)
Io based on spark test result or other assessment, ex. 133 mA for Uo = 15 V (Group IIC, rectangular characteristic)
No specification of Lo and Co in the certificate and on the label.

Cable

The cable used to interconnect the devices needs to comply with the following parameters:
loop resistance R': 15 . . . 150 Ω/km
inductance per unit length L': 0.4 . . . 1 mH/km
capacitance per unit length C': 80 . . . 200 nF/km
C' = C' line/line + 0.5 C' line/screen, if both lines are floating
or
C' = C' line/line + C' line/screen, if the screen is connected to one line
length of spur cable: max. 30 m (EEx ia IIC T4) or 120 m (EEx ia IIB T4)
length of trunk cable: max. 1 km (EEx ia IIC T4) or 1.9 km (EEx ia IIB T4)

Terminators

The terminator must be certified by a notify body as FISCO model and at each end of the trunk cable an approved line terminator with the following parameters is suitable:
R = 90 . . . 100 Ω
C = 0 . . . 2.2 µF.
The resistor must be infallible according to IEC 60079-11. One of the two allowed terminators might already be integrated in the associated apparatus (bus supply unit).

FIELD INSTRUMENTS

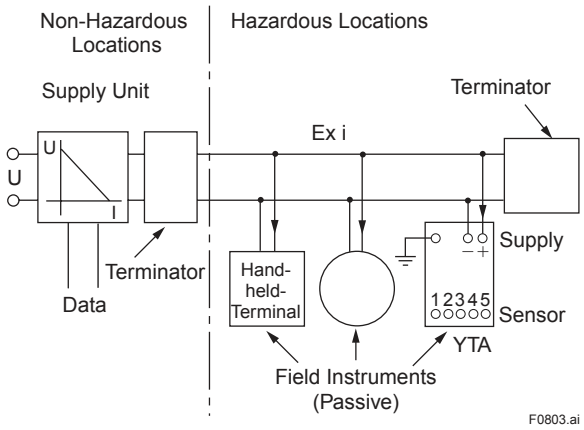
Intrinsically safe ratings of the transmitter (FIELD INSTRUMENTS) are as follows:

Supply/output circuit
EEx ia IIC T4
Maximum Voltage (Ui) = 17.5 V
Maximum Current (Ii) = 360 mA
Maximum Power (Pi) = 2.52 W
Internal Capacitance (Ci) = 1.5 nF
Internal Inductance (Li) = 8µH
EEx ia IIB T4
Maximum Voltage (Ui) = 17.5 V
Maximum Current (Ii) = 380 mA
Maximum Power (Pi) = 5.32 W
Internal Capacitance (Ci) = 1.5 nF
Internal Inductance (Li) = 8 µH
Sensor circuit
EEx ia IIC T4
Maximum Voltage (Uo) = 7.7 V
Maximum Current (Io) = 70 mA
Maximum Power (Po) = 140 mW
External Capacitance (Co) = 1.6 µF
External Inductance (Lo) = 7.2 mH

Number of Devices

The number of devices (max. 32) possible on a fieldbus link depends on factors such as the power consumption of each device, the type of cable used, use of repeaters, etc.

(2) Entity Model



I.S. fieldbus system complying with Entity model

I.S. values Power supply-field device:
Po ≤ Pi, Uo ≤ Ui, Io ≤ Ii
Calculation of max. allowed cable length:
Ccable ≤ Co - Σci - Σci (Terminator)
Lcable ≤ Lo - ΣLi

FIELD INSTRUMENTS

Intrinsically safe ratings of the transmitter (FIELD INSTRUMENTS) are as follows:
Supply/output circuit
EEx ia IIC T4
Maximum Voltage (Ui) = 24.0 V
Maximum Current (Ii) = 250 mA
Maximum Power (Pi) = 1.2 W
Internal Capacitance (Ci) = 1.5 nF
Internal Inductance (Li) = 8 µH

Sensor circuit
EEx ia IIC T4
Maximum Voltage (Uo) = 7.7 V
Maximum Current (Io) = 70 mA
Maximum Power (Po) = 140 mW
External Capacitance (Co) = 1.6 µF
External Inductance (Lo) = 7.2 mH

Number of Devices

The number of devices (max. 32) possible on a fieldbus link depends on factors such as the power consumption of each device, the type of cable used, use of repeaters, etc.

C) ATEX Intrinsically Safe "ic"

Caution for ATEX Intrinsically Safe "ic"

Note 1. Model YTA320-F/KN25 temperature transmitters for potentially explosive atmospheres:
* Applicable Standard: EN 60079-0: 2009, EN 60079-0: 2012, EN 60079-11: 2012
* Type of Protection and Marking: Ex II 3 G Ex ic IIC T4 Gc
* Ambient Temperature: –30 to 70°C
Ambient Humidity: 0 to 100 %
(No condensation)
* IP Code: IP67
* Overvoltage Category: I

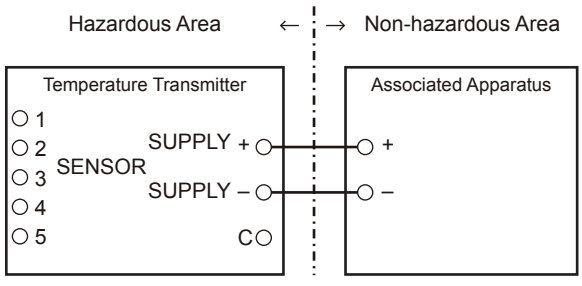
Note 2. Electrical Data
[Supply Input]
Maximum input voltage, Ui = 32Vdc
Effective internal capacitance, Ci = 2.4 nF
Effective internal inductance, Li = 8 µH
[Sensor Output]
Maximum output voltage, Uo = 7.7 V
Maximum output current, Io = 70 mA
Maximum output power, Po = 140 mW
Maximum allowed external capacitance, Co = 1.6 µF
Maximum allowed external inductance, Lo = 7.2 mH
• The above parameters apply when one of the two conditions below is given:
- the total Li of the external circuit (excluding the cable) is < 1% of the Lo value or
- the total Ci of the external circuit (excluding the cable) is < 1% of the Co value.
• The above parameters are reduced to 50% when both of the two conditions below are given:
- the total Li of the external circuit (excluding the cable) is ≥ 1% of the Lo value and
- the total Ci of the external circuit (excluding the cable) is ≥ 1% of the Co value.
• The reduced capacitance of the external circuit (including cable) shall not be greater than 1µF for Group IIB and 600nF for Group IIC.

Note 3. Operation
• Keep strictly the "WARNING" on the label on the transmitter.
WARNING: POTENTIAL ELECTROSTATIC CHARGING HAZARD - SEE USER'S MANUAL

Note 4. Installation
• Cable glands, adapters and/or blanking elements shall be of Ex "n", Ex "e" or Ex "d" and shall be installed so as to maintain the specified degree of protection (IP code) of the equipment.

Note 5. Specific Conditions of Use
• Precautions shall be taken to minimize the risk from electrostatic discharge of painted parts.
• The dielectric strength of at least 500 V a.c. r.m.s between the intrinsically safe circuits and the enclosure of the Model YTA series temperature transmitter is limited only by the overvoltage protection.
• Nonmetallic stickers which include no information for intrinsic safety can be applied on the surface of enclosure as long as each surface area of the sticker is less than 400 mm^2

Note 6. Installation Diagram



Electrical data are as follows;
Supply Input (Terminals: + and -)
Ui = 32 V
Ci = 2.4 nF
Li = 8 µH

Sensor Output (Terminals: 1 to 5)
Uo = 7.7 V
Io = 70 mA
Po = 140 mW
Co = 1.6 µF
Lo = 7.2 mH

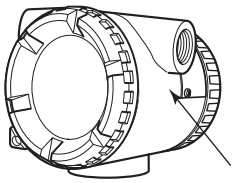
F0804.ai

(2) Electrical Connection

The type of electrical connection is stamped near the electrical connection port according to the following marking.

Screw Size	Marking
ISO M20×1.5 female	⚠ M
ANSI 1/2 NPT female	⚠ A

T0801.ai



Location of the marking

F0805.ai

(3) Installation

WARNING

All wiring shall comply with local installation requirement and local electrical code.

(4) Operation

WARNING

- OPEN CIRCUIT BEFORE REMOVING COVER. INSTALL IN ACCORDANCE WITH THIS USER'S MANUAL
- Take care not to generate mechanical sparking when access to the instrument and peripheral devices in hazardous locations.

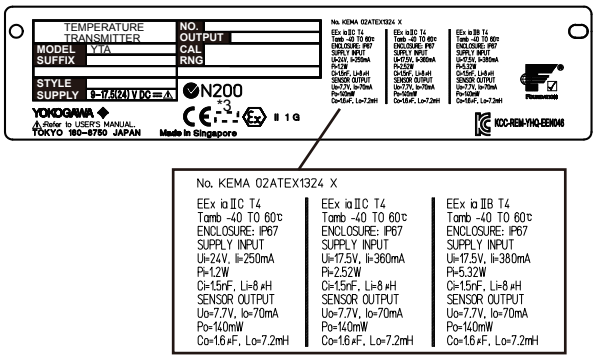
(5) Maintenance and Repair

WARNING

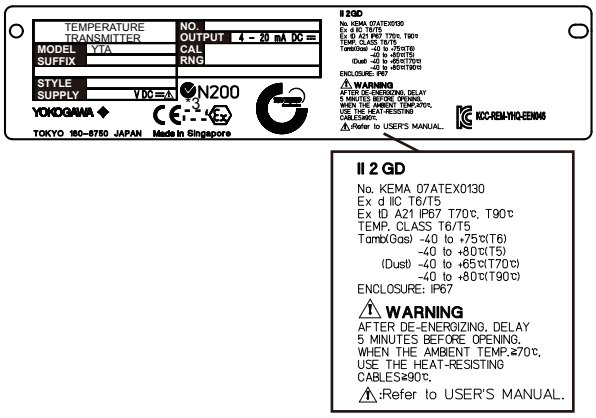
The instrument modification or parts replacement by other than authorized Representative of Yokogawa Electric Corporation is prohibited and will void the certification.

(6) Name Plate

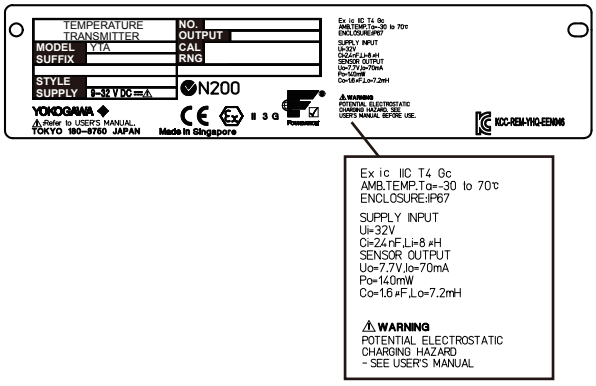
● Name plate for intrinsically safe type


TEMPERATURE TRANSMITTER
MODEL YTA
SUFFIX
STYLE
SUPPLY
NO.
OUTPUT
CAL
RNG
N200
YOKOGAWA
TOKYO 180-8750 JAPAN
Made in Singapore
II 1G
No. KEMA 02ATEX1324 X
EEx ia IIC T4 Tamb -40 TO 60℃ ENCLOSURE: IP67 SUPPLY INPUT Ui=24V, Ii=250mA Pi=1.2W Ci=15nF, Li=8 μH SENSOR OUTPUT Uo=7.7V, Io=70mA Po=140mW Co=1.6 μF, Lo=7.2mH
EEx ia IIC T4 Tamb -40 TO 60℃ ENCLOSURE: IP67 SUPPLY INPUT Ui=17.5V, Ii=360mA Pi=2.52W Ci=15nF, Li=8 μH SENSOR OUTPUT Uo=7.7V, Io=70mA Po=140mW Co=1.6 μF, Lo=7.2mH
EEx ia IIB T4 Tamb -40 TO 60℃ ENCLOSURE: IP67 SUPPLY INPUT Ui=17.5V, Ii=380mA Pi=5.32W Ci=15nF, Li=8 μH SENSOR OUTPUT Uo=7.7V, Io=70mA Po=140mW Co=1.6 μF, Lo=7.2mH

● Name plate for flameproof type



● Name plate for intrinsically safe type Ex ic



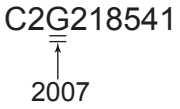
F0806.ai

MODEL: Specified model code.
SUFFIX: Specified suffix code.
STYLE: Style code.
SUPPLY: Supply voltage.
NO.: Serial number and year of production*1.
OUTPUT: Output signal.
FACTORY CAL: Specified calibration range.
YOKOGAWA ◆ TOKYO 180-8750 JAPAN:
The manufacturer name and the address*2.

*1: The production year
The third figure from the left of the serial number shows the year of production. The relation between the third figure and the production year is shown below.

Third figure	D	E	F	G	H	J	K
Production year	2004	2005	2006	2007	2008	2009	2010

For example, the production year of the product engraved in “NO.” column on the name plate as follows is 2007.



*2: “180-8750” is a zip code which represents the following address.

2-9-32 Nakacho, Musashino-shi, Tokyo Japan

*3: The identification number of Notified Body

8.1.3 FM Certification

A) FM Explosionproof Type

Caution for FM Explosionproof type

Note 1. Model YTA320-F /FF1 temperature transmitters are applicable for use in hazardous locations:
* Applicable Standard: FM 3600, FM 3615, FM 3810, NEMA250
* Explosionproof for Class I, Division 1, Groups A, B, C, and D.
* Dust-ignitionproof for Class II/III, Division 1, Groups E, F and G.
* Enclosure rating: NEMA 4X.
* Temperature Class: T6
* Ambient Temperature: –40 to 60°C
* Supply Voltage: 32 V dc max.

Note 2. Wiring
* All wiring shall comply with National Electrical Code ANSI/NEPA70 and Local Electrical Codes.
* “FACTORY SEALED, CONDUIT SEAL NOT REQUIRED”.

Note 3. Operation
* Keep strictly the “WARNING” on the nameplate attached on the transmitter.
WARNING: OPEN CIRCUIT BEFORE REMOVING COVER.
“FACTORY SEALED, CONDUIT SEAL NOT REQUIRED”.
INSTALL IN ACCORDANCE WITH THE INSTRUCTION MANUAL IM 1C50B1.
* Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous location.

Note 4. Maintenance and Repair
* The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void Factory Mutual Explosionproof Approval.

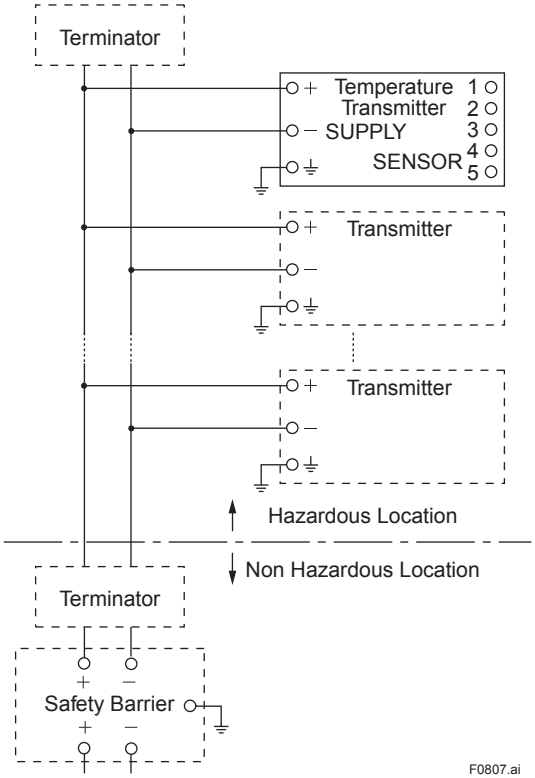
B) FM Intrinsically Safe Type

Model YTA Series temperature transmitters with optional code /FS15.
* Applicable Standard: FM 3600, FM 3610, FM 3611, FM 3810, NEMA250, ANSI/ISA-60079-0, ANSI/ISA-60079-11

- FM Intrinsically Safe Approval
  [Entity Model]
  Class I, II & III, Division 1, Groups A, B, C, D, E, F & G, Temperature Class T4 Ta=60°C, Type 4X and Class I, Zone 0, AEx ia IIC, Temperature Class T4 Ta=60°C, Type 4X
  [FISCO Model]
  Class I, II & III, Division 1, Groups A, B, C, D, E, F & G, Temperature Class T4 Ta=60°C, Type 4X and Class I, Zone 0, AEx ia IIC, Temperature Class T4 Ta=60°C, Type 4X
- Nonincendive Approval
  Class I, Division 2, Groups A, B, C & D and Class I, Zone 2, Group IIC
  Class II, Division 2, groups F & G, Temperature Class: T4
  Enclosure: NEMA 4X
- Electrical Connection: 1/2 NPT female
- Caution for FM Intrinsically safe type. (Following contents refer to “DOC. No. IFM018-A12 p.1, p.2, p.3, and p.3-1.”)

■ IFM018-A12

● Installation Diagram (Intrinsically safe, Division 1 Installation)



*1: Dust-tight conduit seal must be used when installed in Class II and Class III environments.
*2: Control equipment connected to the Associated Apparatus must not use or generate more than 250 Vrms or Vdc.
*3: Installation should be in accordance with ANSI/ISA RP12/6 “Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations” and the National Electrical Code (ANSI/NFPA 70) Sections 504 and 505.
*4: The configuration of Associated Apparatus must be Factory Mutual Research Approved under FISCO Concept.
*5: Associated Apparatus manufacturer’s installation drawing must be followed when installing this equipment.
*6: The YTA Series are approved for Class I, Zone 0, applications. If connecting AEx (ib) associated Apparatus or AEx ib I.S. Apparatus to the Zone 2, and is not suitable for Class I, Zone 0 or Class I, Division 1, Hazardous (Classified) Locations.
*7: No revision to drawing without prior Factory Mutual Research Approval.
*8: Terminator must be FM Approved.

Electrical Data:

• Rating 1 (Entity and nonincendive)
For Groups A, B, C, D, E, F, and G or Group IIC
Maximum Input Voltage Vmax: 24 V
Maximum Input Current Imax: 250 mA
Maximum Input Power Pi: 1.2 W
Maximum Internal Capacitance Ci: 1.5 nF
Maximum Internal Inductance Li: 8 µH

or

• Rating 2 (FISCO)
For Groups A, B, C, D, E, F, and G or Group IIC
Maximum Input Voltage Vmax: 17.5 V
Maximum Input Current Imax: 360 mA
Maximum Input Power Pi: 2.52 W
Maximum Internal Capacitance Ci: 1.5 nF
Maximum Internal Inductance Li: 8 µH

or

• Rating 3 (FISCO)
For Groups C, D, E, F, and G or Group IIB
Maximum Input Voltage Vmax: 17.5 V
Maximum Input Current Imax: 380 mA
Maximum Input Power Pi: 5.32 W
Maximum Internal Capacitance Ci: 1.5 nF
Maximum Internal Inductance Li: 8 µH

and

• Rating 4 (Sensor circuit)
Maximum Output Voltage Uo: 6.7 V
Maximum Output Current Io: 60 mA
Maximum Output Power Po: 100 mW
Maximum External Capacitance Co: 10 µF
Maximum External Inductance Lo: 10 µH

Note: In the rating 1, the output current of the barrier must be limited by a resistor “Ra” such that Io=Uo/Ra. In the rating 2 or 3, the output characteristics of the barrier must be the type of trapezoid which are certified as the FISCO model (See “FISCO Rules”). The safety barrier may include a terminator. More than one field instruments may be connected to the power supply line.

● FISCO Rules

The FISCO Concept allows the interconnection of intrinsically safe apparatus to associated apparatus not specifically examined in such combination. The criterion for such interconnection is that the voltage (Ui), the current (Ii) and the power (Pi) which intrinsically safe apparatus can receive and remain intrinsically safe, considering faults, must be equal or greater than the voltage (Uo, Voc, Vt), the current (Io) and the power (Po) which can be provided by the associated apparatus (supply unit). In addition, the maximum unprotected residual capacitance (Ci) and inductance (Li) of each apparatus (other than the terminators) connected to the fieldbus must be less than or equal to 5 nF and 10 µH respectively.
In each I.S. fieldbus segment only one active source, normally the associated apparatus, is allowed to provide the necessary power for the fieldbus system.

The allowed voltage Uo of the associated apparatus used to supply the bus is limited to the range of 14 V dc to 24 V dc. All other equipment connected to the bus cable has to be passive, meaning that the apparatus is not allowed to provide energy to the system, except to a leakage current of 50 µA for each connected device.

Supply unit

Trapezoidal or rectangular output characteristic only

Uo = 14...24 V (I.S. maximum value)
Io according to spark test result or other assessment, e.g. 133 mA for *Uo* = 15 V (Group IIC, rectangular characteristic) No specification of *Lo* and *Co* in the certificate and on the label.

Cable

The cable used to interconnect the devices needs to comply with the following parameters:

loop resistance *R'*: 15...150 Ω/km
inductance per unit length *L'*: 0.4...1 mH/km
capacitance per unit length *C'*: 80...200 nF/km
C'=*C'* line/line+0.5 *C'* line/screen, if both lines are floating

or

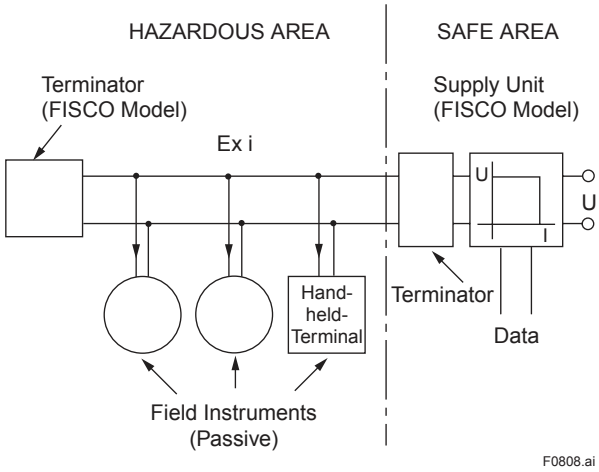
C'=*C'* line/line+*C'* line/screen, if the screen is connected to one line
length of spur cable: max. 30 m (Group IIC) or 120 m (Group IIB)
length of trunk cable: max. 1 km (Group IIC) or 1.9 km (Group IIB)

Terminators

At each end of the trunk cable an approved line terminator with the following parameters is suitable:
R = 90...100 Ω
C = 0...2.2 F
The resistor must be infallible according to IEC 60079-11. One of the two allowed terminators might already be intergrated in the associated apparatus (bus supply unit)

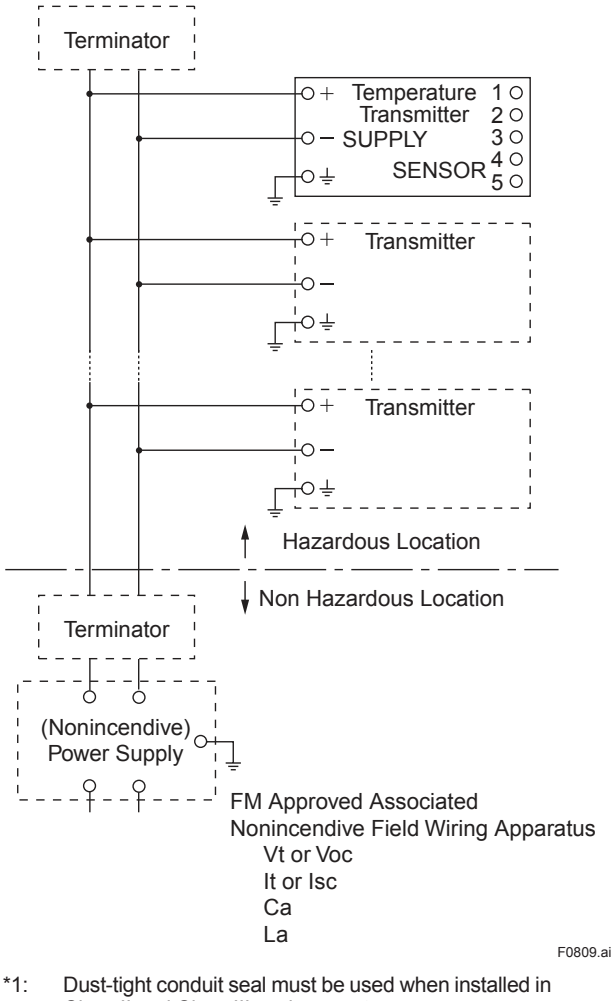
System evaluations

The number of passive device like transmitters, actuators, hand held terminals connected to a single bus segment is not limited due to I.S. reasons. Furthermore, if the above rules are respected, the inductance and capacitance of the cable need not to be considered and will not impair the intrinsic safety of the installation.



I.S. fieldbus system complying with FISCO model

● Installation Diagram (Nonincendive, Division 2 Installation)



*1: Dust-tight conduit seal must be used when installed in Class II and Class III environments.
*2: Installation should be in accordance with and the National Electrical Code® (ANSI/NFPA 70) Sections 504 and 505.
*3: The configuration of Associated Nonincendive Field Wiring Apparatus must be FM Approved.

*4: Associated Nonincendive Field Wiring Apparatus manufacturer's installation drawing must be followed when installing this equipment.
*5: No revision to drawing without prior FM Approvals.
*6: Terminator and supply unit must be FM Approved.
*7: If use ordinary wirings, the general purpose equipment must have nonincendive field wiring terminal approved by FM Approvals.
*8: The nonincendive field wiring circuit concept allows interconection of nonincendive field wiring apparatus with associated nonincendive field wiring apparatus, using any of the wiring methods permitted for unclassified locations.
*9: Installation requirements;
Vmax ≥ Voc or Vt
Imax = see note 10
Ca ≥ Ci + Ccable
La ≥ Li + Lcable
*10: For this current controlled circuit, the parameter (Imax) is not required and need not be aligned with parameter (Isc or It) of the barrier or associated nonincendive field wiring apparatus.

Electrical Data:

• Supply Input (+ and –)
Maximum Input Voltage Vmax: 32 V
Maximum Internal Capacitance Ci: 1.5 nF
Maximum Internal Inductance Li: 8 µH
• Sensor Output (1 to 5)
Maximum Output Voltage Voc: 6.7 V
Maximum External Capacitance Co: 1.6 µF
Maximum External Inductance Lo: 7.2 mH

8.1.4 IECEx Certification

A) IECEx Flameproof Type and Dust Ignition Proof Type

Caution for IECEx flameproof type and Dust Ignition Proof Type

Note 1. Model YTA320/SF2 temperature transmitters are applicable for use in hazardous locations:
* No. IECEx KEM 07.0044
* Applicable Standard: IEC 60079-0:2004, IEC 60079-1:2007-4, IEC 61241-0:2004, IEC 61241-1:2004
* Type of Protection and Marking Code: Ex d IIC T6/T5, Ex tD A21 IP67 T70°C, T90°C
* Ambient Temperature for Gas Atmospheres:
–40 to 75°C (T6), –40 to 80°C (T5)
* Ambient Temperature for Dust Atmospheres:
–40 to 65°C (T70°C), –40 to 80°C (T90°C)
* Enclosure: IP67

Note 2. Electrical Data
* Supply voltage: 42 V dc max.
* Output signal: 4 to 20 mA

Note 3. Installation
* All wiring shall comply with local installation requirement.

B) IECEx Intrinsically Safe type / type n

Caution for IECEx Intrinsically Safe and type n.

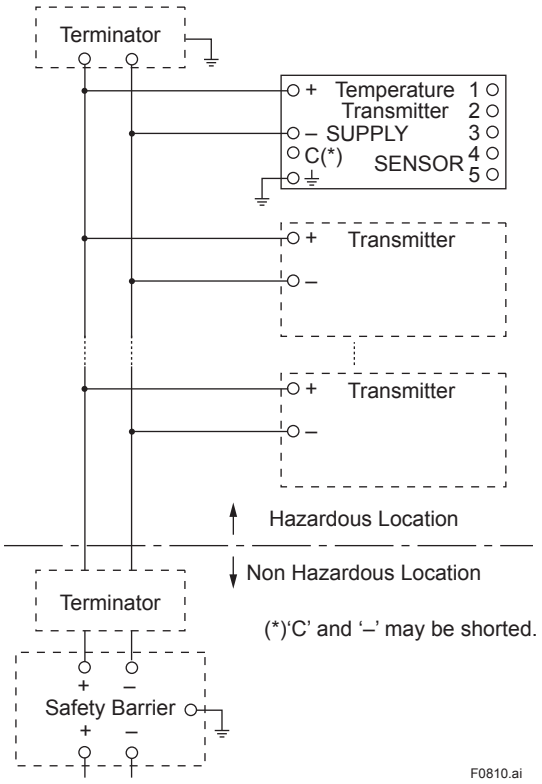
Note 1. Mode YTA320 temperature transmitter with optional code /SS25 are applicable for use in hazardous locations.
* No. IECEx CSA 05.0014
* Applicable Standards: IEC 60079-0:2000, IEC 60079-11:1999, IEC 60079-15:2001
* Ex ia IIB/IIC T4, Ex nL IIC T4;
* Ambient Temperature: –40 to 60°C
* Enclosure: IP66 and IP67

Note 2. Electrical Data
* Intrinsic Safety Electrical Parameters
Ex ia IIC[Entity]: Ui=24 V, Ii=250 mA, Pi=1.2 W, Ci=1.5 nF, Li=8 µH
Ex ia IIC[FISCO]: Ui=17.5 V, Ii=360 mA, Pi=2.52 W, Ci=1.5 nF, Li=8 µH
Ex ia IIB[FISCO]: Ui=17.5 V, Ii=380 mA, Pi=5.32 W, Ci=1.5 nF, Li=8 µH
Sensor Output: Uo=7.7 V, Io=70 mA, Po=140 mW, Co=1.6 µF, Lo=7.2 mH
* Type "n" Electrical Parameters
Ex nL IIC: Ui=32 V, Ci=1.5 nF, Li=8 µH
Sensor Output: Uo=7.7 V, Io=70 mA, Po=140 mW, Co=1.6 µF, Lo=7.2 mH

Model YTA320 Temperature transmitter with optional code /SS25 can be selected the type of protection (IECEx Intrinsically Safe or type n) for use in hazardous locations.

Note 1. For the installation of this transmitter, once a particular type of protection is selected, another type of protection cannot be used. The installation must be in accordance with the description about the type of protection in this instruction manual.
Note 2. In order to avoid confusion, unnecessary marking is crossed out on the label other than the selected type of protection when the transmitter is installed.

● Installation Diagram (Installation Diagram for Intrinsically Safe)



Note

- In the rating 1 (*1), the output current of the barrier must be limited by a resistor 'Ra'such that Io=Uo /Ra.
- In the rating 2 (*2), the output of the barrier must be the characteristics of the trapezoid or the rectangle and this transmitter can be connected to Fieldbus equipment which are in according to the FISCO model.
- The safely barrier may include a terminator.
- The terminator may be built in by a barrier.
- The terminator and the safety barrier must be certified by Ex certification bodies.
- More than one field instruments may be connected to the power supply line.
- Do not alter drawing without authorization from Ex certification bodies.
- Input voltage of the safety barrier must be less than 250Vrms/V dc.

Electrical Data:

• Supply Input (+ and –)
Maximum Input Voltage Ui: 24 V *1
Maximum Input Current Ii: 250 mA *1
Maximum Input Power Pi: 1.2 W *1
Maximum Internal Capacitance Ci: 1.5 nF *1
Maximum Internal Inductance Li: 8 µH *1
or
Maximum Input Voltage Ui: 17.5 V *2
Maximum Input Current Ii: 360 mA *2
Maximum Input Power Pi: 2.52 W *2
Maximum Internal Capacitance Ci: 1.5 nF *2
Maximum Internal Inductance Li: 8 µH *2
or
Maximum Input Voltage Ui: 17.5 V *2
Maximum Input Current Ii: 380 mA *2
Maximum Input Power Pi: 5.32 W *2
Maximum Internal Capacitance Ci: 1.5 nF *2
Maximum Internal Inductance Li: 8 µH *2
• Sensor Output (1 to 5)
Maximum Output Voltage Uo: 7.7 V
Maximum Output Current Io: 70 mA
Maximum Output Power Po: 140 mW
Maximum External Capacitance Co: 1.6 µF
Maximum External Inductance Lo: 7.2 mH

● FISCO Rules

The FISCO Concept allows the interconnection of intrinsincally safe apparatus to associated apparatus not specifically examined in such combination. The criterion for such interconnection is that the voltage (Ui), the current (Ii) and the power (Pi) which intrinsically safe apparatus can receive and remain intrinsically safe, considering faults, must be equal or greater than the voltage (Uo, Voc, Vt), the current (Io) and the power (Po) which can be provided by the associated apparatus (supply unit). In addition, the maximum unprotected residual capacitance (Ci) and inductance (Li) of each apparatus (other than the terminators) connected to the fieldbus must be less than or equal to 5 nF and 10 µH respectively.

In each I.S. fieldbus segment only one active source, normally the associated apparatus, is allowed to provide the necessary power for the fieldbus system. The allowed voltage Uo of the associated apparatus used to supply the bus is limited to the range of 14 V dc to 24 V dc. All other equipment connected to the bus cable has to be passive, meaning that the apparatus is not allowed to provide energy to the system, except to a leakage current of 50 µA for each connected device.

Supply unit

Trapezoidal or rectangular output characteristic only

Uo = 14...24 V (I.S. maximum value)
Io according to spark test result or other assessment, e.g. 133 mA for *Uo* = 15 V (Group IIC, rectangular characteristic) No specification of *Lo* and *Co* in the certificate and on the label.

Cable

The cable used to interconnect the devices needs to comply with the following parameters:

loop resistance *R'*: 15...150 Ω/km
inductance per unit length *L'*: 0.4...1 mH/km
capacitance per unit length *C'*: 80...200 nF/km
C'=*C'* line/line+0.5 *C'* line/screen, if both lines are floating
or
C'=*C'* line/line+*C'* line/screen, if the screen is connected to one line
length of spur cable: max. 30 m (Group IIC) or 120 m (Group IIB)
length of trunk cable: max. 1 km (Group IIC) or 1.9 km (Group IIB)

Terminators

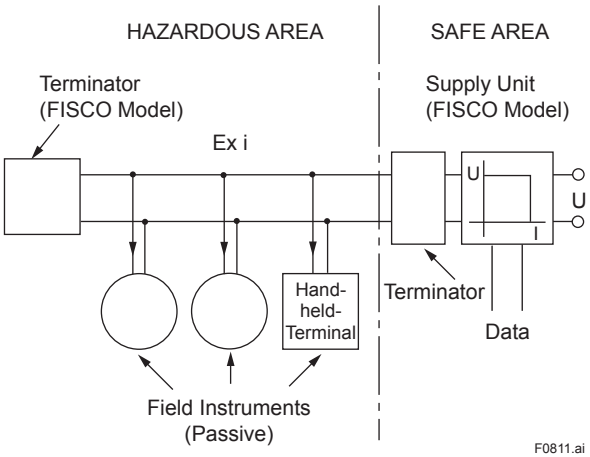
At each end of the trunk cable an approved line terminator with the following parameters is suitable:

R = 90...100 Ω
C = 0...2.2 F

The resistor must be infallible according to IEC 60079-11. One of the two allowed terminators might already be intergrated in the associated apparatus (bus supply unit)

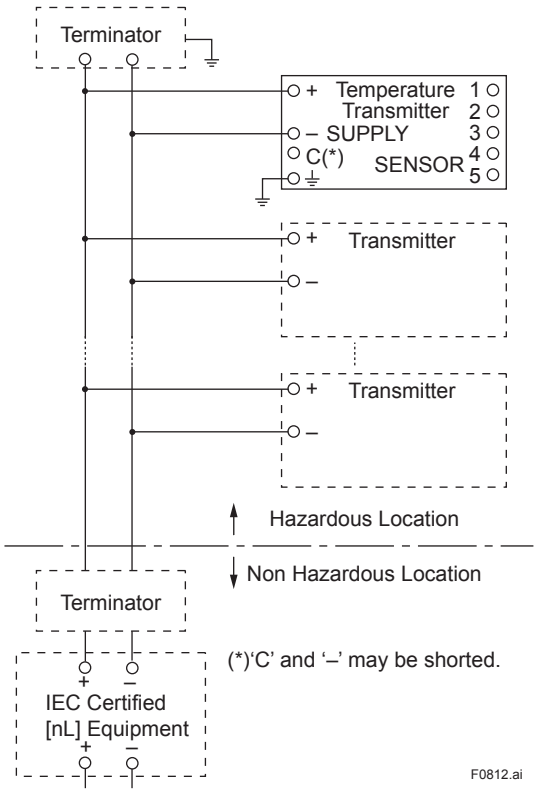
System evaluations

The number of passive device like transmitters, actuators, hand held terminals connected to a single bus segment is not limited due to I.S. reasons.
Furthermore, if the above rules are respected, the inductance and capacitance of the cable need not to be considered and will not impair the intrinsic safety of the installation.



I.S. fieldbus system complying with FISCO model

- **Installation Diagram for Type of protection"n"**



Electrical Data:

• Supply Input (+ and –)
Maximum Input Voltage Ui: 32 V
Maximum Internal Capacitance Ci: 1.5 nF
Maximum Internal Inductance Li: 8 µH

• Sensor Output (1 to 5)
Maximum Output Voltage Uo: 7.7 V
Maximum Output Current Io: 70 mA
Maximum Output Power Po: 140 mW
Maximum External Capacitance Co: 1.6 µF
Maximum External Inductance Lo: 7.2 mH

Note:

- More than one field instruments may be connected to the power supply line.
- Do not alter drawing without authorization from Ex certification bodies.

9. General Specifications

9.1 Standard Specifications

For items other than those described below, refer to IM 01C50B01-01E.

Applicable Model:
YTA320

Accuracy
See Table 9.1 in Page 9-4.

Ambient Temperature Effect per 10°C Change
See Table 9.2 in Page 9-5.

Output Signal:
Digital communication signal based on FOUNDATION Fieldbus protocol.

Supply Voltage:
9 to 32 V DC for general use and flameproof type
9 to 24 V DC for intrinsically safe type Entity model
9 to 17.5 V DC for intrinsically safe type FISCO model

Conditions of Communication Line:
Supply Voltage: 9 to 32 V DC
Supply Current: 16.6 mA (max)

Functional Specifications:
Functional specifications for Fieldbus communication conform to the standard specifications (H1) of FOUNDATION Fieldbus.
Function Block:
Four AI function blocks
Four DI function blocks
One/Two PID function blocks (option)
Link Master funtion

< Settings When Shipped >

Sensor type	'Pt100, 3 wire system' (for both inputs), or as specified in order.
Tag Number (PD tag)	'TT1001' unless otherwise specified in order. (Not engraved on tag plate in such case.) *1
Output Mode (L_TYPE)	'Indirect' unless otherwise specified in order
Calibration Range (XD_SCALE) Lower/Higher Range Value	'0 to 100', or as specified in order
Unit of Calibration Range	Selected from °C and Kelvin. (Only one unit can be specified.) When optional code /D2 is specified, °F and °R can also be specified.
Output Scale (OUT_SCALE) Lower/Higher Range Value	'0 to 100%'
Damping Time Constant (PV_FTIME of TB)	'2 sec.'
Node Address (in hexadecimal)	'0 × F3' unless otherwise specified in order
BOOT_OPERAT_FUNCTION_CLASS	'BASIC' unless otherwise specified in order

9.2 Optional Specifications

For items other than those described below, refer to IM 01C50B01-01E.

tem	Description	Code
ATEX	ATEX Flameproof and Dust Ignition Proof Approval Electrical Connection: 1/2 NPT female and M20 female	**KF2**
	ATEX Intrinsically Safe “ia” Approval Electrical Connection: 1/2 NPT female and M20 female	**KS25**
	ATEX Intrinsically Safe “ic” Electrical Connection: 1/2 NPT female and M20 female	**KN25**
Factory Mutual (FM)	FM Explosionproof Approval Electrical Connection: 1/2 NPT female	**FF1**
	FM Intrinsically Safe Approval Electrical Connection: 1/2 NPT female	**FS15**
Canadian Standards Association (CSA)	CSA Explosionproof Approval Electrical Connection: 1/2 NPT female	**CF1**
IECEx	IECEx Flameproof and Dust ignition proof Approval Electrical Connection: 1/2 NPT female and M20 female	**SF2**
	IECEx Intrinsically safe and type n Electrical Connection: 1/2 NPT female or M20 female	**SS25**
PID function	PID control function (one block)	**LC1**
	PID control function (2 blocks)	**LC2**

Table 9.1 Accuracy

Sensor Type		Reference Standard	Measurement Range		Minimum Span (Recommended)	Accuracy			
						Input range		A/D Accuracy	
			°C	°F		°C	°F	°C	°F
T/C	B	IEC584	100 to 1820	212 to 3308	25°C (45°F)	100 to 300 300 to 400 400 to 1820	212 to 572 572 to 752 752 to 3308	± 3.0 ± 1.0 ± 0.75	± 5.4 ± 1.8 ± 1.35
	E		-200 to 1000	-328 to 1832		-200 to -50 -50 to 1000	-328 to -58 -58 to 1832	± 0.35 ± 0.16	± 0.63 ± 0.29
	J		-200 to 1200	-328 to 2192		-200 to -50 -50 to 1200	-328 to -58 -58 to 2192	± 0.40 ± 0.20	± 0.72 ± 0.36
	K		-200 to 1372	-328 to 2502		-200 to -50 -50 to 1372	-328 to -58 -58 to 2502	± 0.50 ± 0.25	± 0.90 ± 0.45
	N		-200 to 1300	-328 to 2372		-200 to -50 -50 to 1300	-328 to -58 -58 to 2372	± 0.80 ± 0.35	± 1.44 ± 0.63
	R		-50 to 1768	-58 to 3214		-50 to 0 0 to 100 100 to 600 600 to 1768	-58 to 32 32 to 212 212 to 1112 1112 to 3214	± 1.0 ± 0.80 ± 0.60 ± 0.40	± 1.8 ± 1.44 ± 1.08 ± 0.72
	S		-50 to 1768	-58 to 3214		-50 to 0 0 to 100 100 to 600 600 to 1768	-58 to 32 32 to 212 212 to 1112 1112 to 3214	± 1.0 ± 0.80 ± 0.60 ± 0.40	± 1.8 ± 1.44 ± 1.08 ± 0.72
	T		-200 to 400	-328 to 752		-200 to -50 -50 to 400	-328 to -58 -58 to 752	± 0.25 ± 0.14	± 0.45 ± 0.25
	W3	ASTM E988	0 to 2300	32 to 4172		0 to 400 400 to 1400 1400 to 2000 2000 to 2300	32 to 752 752 to 2552 2552 to 3632 3632 to 4172	± 0.80 ± 0.50 ± 0.60 ± 0.90	± 1.44 ± 0.90 ± 1.08 ± 1.62
	W5		0 to 2300	32 to 4172		0 to 400 400 to 1400 1400 to 2000 2000 to 2300	32 to 752 752 to 2552 2552 to 3632 3632 to 4172	± 0.70 ± 0.50 ± 0.70 ± 0.90	± 1.26 ± 0.90 ± 1.26 ± 1.62
	L	DIN43710	-200 to 900	-328 to 1652		-200 to -50 -50 to 900	-328 to -58 -58 to 1652	± 0.30 ± 0.20	± 0.54 ± 0.36
	U		-200 to 600	-328 to 1112		-200 to -50 -50 to 600	-328 to -58 -58 to 1112	± 0.50 ± 0.25	± 0.90 ± 0.45
RTD	Pt100 Pt200 Pt500	IEC751	-200 to 850 -200 to 850 -200 to 850	-328 to 1562 -328 to 1562 -328 to 1562	10°C (18°F)	-200 to 850 -200 to 850 -200 to 850	-328 to 1562 -328 to 1562 -328 to 1562	± 0.10 ± 0.22 ± 0.14	± 0.18 ± 0.40 ± 0.25
	JPt100	JIS C1604	-200 to 500	-328 to 932		-200 to 500	-328 to 932	± 0.10	± 0.18
	Cu	SAMA RC21-4	-70 to 150	-94 to 302		-70 to -40 -40 to 150	-94 to -40 -40 to 302	± 1.35 ± 1.0	± 2.43 ± 1.8
	Ni120	—	-70 to 320	-94 to 608		-70 to 320	-94 to 608	± 0.08	± 0.14
mV		—	-10 to 100 [mV]		3 [mV]	—		±12 [µV]	
ohm			0 to 2000 [Ω]		20 [Ω]			±0.35 [Ω]	

Table 9.2 Ambient Temperature Effect (/10°C Chang)

Sensor Type		Input Range °C			Input Range °F			A/D Coefficient
T/C	B	100	to	300	212	to	572	± (0.530 °C – 0.080 % of reading)
		300	to	1000	572	to	1832	± (0.350 °C – 0.021 % of reading)
		1000	to	1820	1832	to	3308	± (0.140 °C)
	E	-200	to	1000	-328	to	1832	± (0.035 °C + 0.042 % of abs.reading)
	J	-200	to	0	-328	to	32	± (0.039 °C + 0.020 % of abs.reading)
		0	to	1200	32	to	2192	± (0.039 °C + 0.0029 % of reading)
	K	-200	to	0	-328	to	32	± (0.046 °C + 0.020 % of abs.reading)
		0	to	1372	32	to	2502	± (0.046 °C + 0.0054 % of reading)
	N	-200	to	0	-328	to	32	± (0.054 °C + 0.010 % of abs.reading)
		0	to	1300	32	to	2372	± (0.054 °C + 0.0036 % of reading)
	R	-50	to	200	-58	to	392	± (0.210 °C – 0.032 % of abs.reading)
		200	to	1768	392	to	3214	± (0.150 °C)
	S	-50	to	200	-58	to	392	± (0.210 °C – 0.032 % of abs.reading)
		200	to	1768	392	to	3214	± (0.150 °C)
	T	-200	to	0	-328	to	32	± (0.046 °C – 0.036 % of abs.reading)
		0	to	400	32	to	752	± (0.046 °C)
	W3	0	to	1400	32	to	2552	± (0.100 °C + 0.0040 % of reading)
		1400	to	2300	2552	to	4172	± (-0.130 °C + 0.020 % of reading)
	W5	0	to	1400	32	to	2552	± (0.100 °C + 0.0040 % of reading)
		1400	to	2300	2552	to	4172	± (-0.120 °C + 0.020 % of reading)
	L	-200	to	0	-328	to	32	± (0.039 °C + 0.020 % of abs.reading)
		0	to	900	32	to	1652	± (0.039 °C + 0.0029 % of reading)
	U	-200	to	0	-328	to	32	± (0.046 °C + 0.036 % of abs.reading)
		0	to	600	32	o	1112	± (0.046 °C)
RTD	Pt100	-200	to	850	-328	to	1562	± (0.015 °C + 0.005 % of reading)
	Pt200	-200	to	850	-328	to	1562	± (0.023 °C + 0.005 % of reading)
	Pt500	-200	to	850	-328	to	1562	± (0.015 °C + 0.005 % of reading)
	JPt100	-200	to	500	-328	to	932	± (0.015 °C + 0.005 % of reading)
	Cu	-70	to	150	-94	to	302	± (0.320 °C + 0.120 % of reading)
	Ni120	-70	to	320	-94	to	608	± (0.010 °C + 0.005 % of reading)
mV		—						± (0.001mV + 0.0043 % of abs.reading)
ohm		—						± (0.040 Ω + 0.0088 % of reading)

Appendix 1. List of Parameters for Each Block of the YTA

Note: The Write Mode column contains the modes in which each parameter is write enabled.
O/S: Write enabled in O/S mode.
Man: Write enabled in Man mode and O/S mode.
Auto: Write enabled in Auto mode, Man mode, and O/S mode.

A1.1 Resource Block

Relative Index	Index	Parameter Name	Factory Default	Write Mode	Explanation
0	1000	Block Header	TAG:“RS”	Block Tag = O/S	Information on this block such as Block Tag, DD Revision, Execution Time etc.
1	1001	ST_REV	—	—	The revision level of the static data associated with the resource block. The revision value is incremented each time a static parameter value in this block is changed.
2	1002	TAG_DESC	Null	Auto	The user description of the intended application of the block.
3	1003	STRATEGY	1	Auto	The strategy field can be used to identify grouping of blocks. This data is not checked or processed by the block.
4	1004	ALERT_KEY	1	Auto	The identification number of the plant unit. This information may be used in the host for sorting alarms, etc.
5	1005	MODE_BLK	Auto	Auto	The actual, target, permitted, and normal modes of the block.
6	1006	BLOCK_ERR	—	—	This parameter reflects the error status associated with the hardware or software components associated with a block. It is a bit string, so that multiple errors may be shown.
7	1007	RS_STATE	—	—	State of the resource block state machine.
8	1008	TEST_RW	Null	Auto	Read/write test parameter-used only for conformance testing and simulation.
9	1009	DD_RESOURCE	Null	—	String identifying the tag of the resource which contains the Device Description for this resource.
10	1010	MANUFAC_ID	Yokogawa Electric 0x00594543	—	Manufacturer identification number-used by an interface device to locate the DD file for the resource.
11	1011	DEV_TYPE	5	—	Manufacturer’s model number associated with the resource-used by interface devices to locate the DD file for the resource.
12	1012	DEV_REV	X	—	Manufacturer revision number associated with the resource-used by an interface device to locate the DD file for the resource.
13	1013	DD_REV	1	—	Revision of the DD associated with the resource-used by an interface device to locate the DD file for the resource.
14	1014	GRANT_DENY	0	Auto	Options for controlling access of host computer and local control panels to operating, tuning and alarm parameters of the block.
15	1015	HARD_TYPES	Scalar input Discrete input	—	The types of hardware available as channel numbers. bit0: Scalar input bit1: Scalar output bit2: Discrete input bit3: Discrete output

Relative Index	Index	Parameter Name	Factory Default	Write Mode	Explanation
16	1016	RESTART	—	—	Allows a manual restart to be initiated. Several degrees of restart are possible. They are 1: Run, 2: Restart resource, 3: Restart with defaults defined in FF specification*1, and 4: Restart processor.
17	1017	FEATURES	Soft write lock supported Report supported	—	Used to show supported resource block options.
18	1018	FEATURE_SEL	Soft write lock supported Report supported	—	Used to select resource block options.
19	1019	CYCLE_TYPE	Scheduled	—	Identifies the block execution methods available for this resource. bit0: Scheduled bit1: Event driven bit2: Manufacturer specified
20	1020	CYCLE_SEL	Scheduled	—	Used to select the block execution method for this resource.
21	1021	MIN_CYCLE_T	3200 (100ms)	—	Time duration of the shortest cycle interval of which the resource is capable.
22	1022	MEMORY_SIZE	0	—	Available configuration memory in the empty resource. To be checked before attempting a download.
23	1023	NV_CYCLE_T	0	—	Interval between writing copies of NV parameters to non-volatile memory. Zero means never.
24	1024	FREE_SPACE	0	—	Percent of memory available for further configuration. YTA has zero which means a preconfigured resource.
25	1025	FREE_TIME	0	—	Percent of the block processing time that is free to process additional blocks. YTA does not support this.
26	1026	SHED_RCAS	—	—	Time duration at which to give up on computer writes to function block RCas locations. YTA does not support this.
27	1027	SHED_ROUT	—	—	Time duration at which to give up on computer writes to function block ROut locations. YTA does not support this.
28	1028	FAULT_STATE	1: Clear	—	Condition set by loss of communication to an output block, failure promoted to an output block or a physical contact. When fail-safe condition is set, Then output function blocks will perform their FSAFE actions.
29	1029	SET_FSTATE	1: OFF	—	Allows the fail-safe condition to be manually initiated by selecting Set.
30	1030	CLR_FSTATE	1: OFF	—	Writing a Clear to this parameter will clear the device fail-safe state if the field condition, if any, has cleared.
31	1031	MAX_NOTIFY	3	—	Maximum number of unconfirmed notify messages possible.
32	1032	LIM_NOTIFY	3	Auto	Maximum number of unconfirmed alert notify messages allowed.
33	1033	CONFIRM_TIME	640000	Auto	The minimum time between retries of alert reports.
34	1034	WRITE_LOCK	1: Not Locked	Auto	If set, no writes from anywhere are allowed, except to clear WRITE_LOCK. Block inputs will continue to be updated
35	1035	UPDATE_EVT	—	—	This alert is generated by any change to the static data.

Relative Index	Index	Parameter Name	Factory Default	Write Mode	Explanation
36	1036	BLOCK_ALM	—	—	The block alarm is used for all configuration, hardware, connection failure or system problems in the block. The cause of the alert is entered in the subcode field. The first alert to become active will set the Active status in the Status attribute. As soon as the Unreported status is cleared by the alert reporting task, another block alert may be reported without clearing the Active status, if the subcode has changed.
37	1037	ALARM_SUM	Enable	—	The current alert status, unacknowledged states, unreported states, and disabled states of the alarms associated with the function block.
38	1038	ACK_OPTION	0xffff: unack	Auto	
39	1039	WRITE_PRI	0	Auto	Priority of the alarm generated by clearing the write lock.
40	1040	WRITE_ALM	—	—	This alert is generated if the write lock parameter is cleared.
41	1041	ITK_VER	4	—	Version number of interoperability test by Fieldbus Foundation applied to YTA.
42	1042	SOFT_REV		—	YTA software revision number.
43	1043	SOFT_DESC		—	Yokogawa internal use.
44	1044	SIM_ENABLE_MSG	Null	Auto	Software switch for simulation function.
45	1045	DEVICE_STATUS_1	0	—	Device status (VCR setting etc.)
46	1046	DEVICE_STATUS_2	0	—	Device status (failure or setting error etc.)
47	1047	DEVICE_STATUS_3	0	—	Device status (failure or setting error etc.)
48	1048	DEVICE_STATUS_4	0	—	Device status
49	1049	DEVICE_STATUS_5	0	—	Device status
50	1050	DEVICE_STATUS_6	0	—	Device status
51	1051	DEVICE_STATUS_7	0	—	Device status
52	1052	DEVICE_STATUS_8	0	—	Device status

*1: FF-891 “Foundation™ Specification Function Block Application Process Part 2”

A1.2 AI Function Block

Relative Index	Index				Parameter Name	Factory Default	Write Mode	Explanation
	AI1	AI2	AI3	AI4				
0	4000	4100	4200	4300	Block Header	TAG:“AI1”, “AI2”,“AI3” or “AI4”	Block Tag = O/S	Information on this block such as Block Tag, DD Revision, Execution Time etc. The value for “Period of Execution” should be larger than “Execution Time.”
1	4001	4101	4201	4301	ST_REV	—	—	The revision level of the static data associated with the function block. The revision value will be incremented each time a static parameter value in the block is changed.
2	4002	4102	4202	4302	TAG_DESC	(blank)	Auto	The user description of the intended application of the block.
3	4003	4103	4203	4303	STRATEGY	1	Auto	The strategy field can be used to identify grouping of blocks. This data is not checked or processed by the block.
4	4004	4104	4204	4304	ALERT_KEY	1	Auto	The identification number of the plant unit. This information may be used in the host for sorting alarms, etc.
5	4005	4105	4205	4305	MODE_BLK	AI1,AI2:Auto AI3,AI4:O/S	Auto	The actual, target, permitted, and normal modes of the block.
6	4006	4106	4206	4306	BLOCK_ERR	—	—	This parameter reflects the error status associated with the hardware or software components associated with a block. It is a bit string, so that multiple errors may be shown.

Relative Index	Index				Parameter Name	Factory Default	Write Mode	Explanation
	AI1	AI2	AI3	AI4				
7	4007	4107	4207	4307	PV	—	—	Either the primary analog value for use in executing the function, or a process value associated with it. May also be calculated from the READBACK value of an AO block.
8	4008	4108	4208	4308	OUT	—	Value = Man	The primary analog value calculated as a result of executing the function.
9	4009	4109	4209	4309	SIMULATE	Disable	Auto	Allows the transducer analog input or output to the block to be manually supplied when simulate is enabled. When simulation is disabled, the simulate value and status track the actual value and status.
10	4010	4110	4210	4310	XD_SCALE	Specified at the time of order	O/S	The high and low scale values, engineering units code, and number of digits to the right of the decimal point used with the value obtained from the transducer for a specified channel. Refer to Table A1.5 for the unit available.
11	4011	4111	4211	4311	OUT_SCALE	0 - 100 %	O/S	The high and low scale values, engineering units code, and number of digits to the right of the decimal point to be used in displaying the OUT parameter and parameters which have the same scaling as OUT.
12	4012	4112	4212	4312	GRANT_ DENY	0	Auto	Options for controlling access of host computers and local control panels to operating, tuning and alarm parameters of the block.
13	4013	4113	4213	4313	IO_OPTS	0	O/S	Options which the user may select to alter input and output block processing.
14	4014	4114	4214	4314	STATUS_ OPTS	0	O/S	Options which the user may select in the block processing of status.
15	4015	4115	4215	4315	CHANNEL	AI1: 1 AI2: 2 AI3,AI4: 3	O/S	The number of the logical hardware channel that is connected to this I/O block. This information defines the transducer to be used going to or from the physical world.
16	4016	4116	4216	4316	L_TYPE	Specified at the time of order	Man	Determines if the values passed by the transducer block to the AI block may be used directly (Direct) or if the value is in different units and must be converted linearly (Indirect), or with square root (Ind Sqr Root), using the input range defined by the transducer and the associated output range.
17	4017	4117	4217	4317	LOW_CUT	0%	Auto	Limit used in square root processing. A value of zero percent of scale is used in block processing if the transducer value falls below this limit, in % of scale. This feature may be used to eliminate noise near zero for a flow sensor.
18	4018	4118	4218	4318	PV_FTIME	0sec	Auto	Time constant of a single exponential filter for the PV, in seconds.
19	4019	4119	4219	4319	FIELD_VAL	—	—	Raw value of the field device in percent of thePV range, with a status reflecting the Transducer condition, before signal characterization (L_TYPE) or filtering (PV_FTIME).
20	4020	4120	4220	4320	UPDATE_ EVT	—	—	This alert is generated by any change to the static data.

Relative Index	Index				Parameter Name	Factory Default	Write Mode	Explanation
	AI1	AI2	AI3	AI4				
21	4021	4121	4221	4321	BLOCK_ALM	—	—	The block alarm is used for all configuration, hardware, connection failure or system problems in the block. The cause of the alert is entered in the subcode field. The first alert to become active will set the Active status in the Status attribute. As soon as the Unreported status is cleared by the alert reporting task, another block alert may be reported without clearing the Active status, if the subcode has changed.
22	4022	4122	4222	4322	ALARM_ SUM	Enable	—	The current alert status, unacknowledged states, unreported states, and disabled states of the alarms associated with the function block.
23	4023	4123	4223	4323	ACK_ OPTION	0xfff : unack	Auto	Selection of whether alarms associated with the block will be automatically acknowledged.
24	4024	4124	4224	4324	ALARM_HYS	0.5%	Auto	Amount the PV must return within the alarm limits before the alarm condition clears. Alarm Hysteresis is expressed as a percent of the PV span.
25	4025	4125	4225	4325	HI_HI_PRI	0	Auto	Priority of the high high alarm.
26	4026	4126	4226	4326	HI_HI_LIM	+INF	Auto	The setting for high high alarm in engineering units.
27	4027	4127	4227	4327	HI_PRI	0	Auto	Priority of the high alarm.
28	4028	4128	4228	4328	HI_LIM	+INF	Auto	The setting for high alarm in engineering units.
29	4029	4129	4229	4329	LO_PRI	0	Auto	Priority of the low alarm.
30	4030	4130	4230	4330	LO_LIM	–INF	Auto	The setting for the low alarm in engineering units.
31	4031	4131	4231	4331	LO_LO_PRI	0	Auto	Priority of the low low alarm.
32	4032	4132	4232	4332	LO_LO_LIM	–INF	Auto	The setting of the low low alarm in engineering units.
33	4033	4133	4233	4333	HI_HI_ALM	—	—	The status for high high alarm and its associated time stamp.
34	4034	4134	4234	4334	HI_ALM	—	—	The status for high alarm and its associated time stamp.
35	4035	4135	4235	4335	LO_ALM	—	—	The status of the low alarm and its associated time stamp.
36	4036	4136	4236	4336	LO_LO_ALM	—	—	The status of the low low alarm and its associated time stamp.

A1.3 DI Function Block

Relative Index	Index				Parameter Name	Default (factory setting)	Write	Description
	DI1	DI2	DI3	DI4				
0	6000	6100	6200	6300	BLOCK HEADER		Block tag = O/S	Information about this block, including the block tag, DD revision, execution time. The value for “Period of Execution” should be larger than “Execution Time.”
1	6001	6101	6201	6301	ST_REV	0	—	Incremented when a change is made to the parameter settings for the DI block to indicate the revision level of the settings, and used to see whether there is a change in parameter settings.
2	6002	6102	6202	6302	TAG_DESC	Spaces		Universal parameter storing the description of the tag.
3	6003	6103	6203	6303	STRATEGY	1		Universal parameter used by an upper-level system to classify the function blocks.

Relative Index	Index				Parameter Name	Default (factory setting)	Write	Description
	DI1	DI2	DI3	DI4				
4	6004	6104	6204	6304	ALERT_KEY	1		Universal parameter used as a key to identify the point from which an alert is issued; normally used by an upper-level system to select alerts to provide to a particular operator who covers a specific area of the plant.
5	6005	6105	6205	6305	MODE_BLK	O/S		Universal parameter that indicates the block operation conditions and is composed of actual mode, target mode, permitted modes, and normal mode.
6	6006	6106	6206	6306	BLOCK_ERR	—	—	Indicates the error statuses related to the block itself.
7	6007	6107	6207	6307	PV_D	—	—	Indicates the primary discrete value (or the corresponding process value) used to execute the specified actions, and the status of that value.
8	6008	6108	6208	6308	OUT_D	—	Man	Indicates the output value and its status.
9	6009	6109	6209	6309	SIMULATE_D	disabled	—	Used to determine whether to use the limit switch signal input from the transducer block or use the user-set value. When this parameter is set to disable, the block uses the actual input value and status.
10	6010	6110	6210	6310	XD_STATE	0		Index to the text describing the states of the discrete value obtained from the transducer, but not supported by YTA.
11	6011	6111	6211	6311	OUT_STATE	0		Index to the text describing the states of a discrete output, but not supported by YTA.
12	6012	6112	6212	6312	GRANT_ DENY	0		Used to check whether various user operations can be put into effective. Before operations, in the GRANT parameter component, set the bits (to 1) corresponding to the intended operations. After the operations, check the DENY parameter component. If the corresponding bits are not set (to 1) in DENY, it proves that the corresponding operation has been put into effective.
13	6013	6113	6213	6313	IO_OPTS	0	O/S	Settings for the I/O processing of the block.
14	6014	6114	6214	6314	STATUS_ OPTS	0	O/S	Defines block actions depending on block status conditions. In YTA, bit 0: Invert alone is available.
15	6015	6115	6215	6315	CHANNEL	7/8/9/10	O/S	Defines the channel number of the hardware channel connected to the transducer block.
16	6016	6116	6216	6316	PV_FTIME	0 second		Time constant of filter for PV_D.
17	6017	6117	6217	6317	FIELD_VAL_ D	—	—	Status of limit switch signal obtained from the transducer block
18	6018	6118	6218	6318	UPDATE_ EVT	—	—	Shows the contents of an update event upon occurrence.
19	6019	6119	6219	6319	BLOCK_ALM	—	—	Shows the contents of a block alarm upon occurrence.
20	6020	6120	6220	6320	ALARM_SUM	enable		Shows the alarm summary (current alarm statuses, acknowledged/unacknowledged states, masking states) for the DI block.
21	6021	6121	6221	6321	ACK_OPTION	0xffff: unack		Defines the priority of WRITE_ALM as well as allows for notification to be disabled and makes acknowledement unnecessary for WRITE_ALM .
22	6022	6122	6222	6322	DISC_PRI	0	—	Priority order of discrete alarm
23	6023	6123	6223	6323	DISC_LIM	0		Input status of generating a discrete alarm
24	6024	6124	6224	6324	DISC_ALM	—		Status of discrete alarm

A1.4 Transducer Block

Relative Index	Index	Parameter Name	Default (factory setting)	Write	Description
0	2000	Block Header	Tag: "TB"	Block tag = O/S	Information about this block, including the block tag, DD revision, and execution time.
1	2001	ST_REV	—	—	Incremented when a change is made to the parameter settings for the transducer block to indicate the revision level of the settings, and used to see whether or not there is a change in parameter settings.
2	2002	TAG_DESC	Blank	Auto	Universal parameter storing the description of the tag
3	2003	STRATEGY	1	Auto	Universal parameter used by an upper-level system to classify the function blocks
4	2004	ALERT_KEY	1	Auto	Universal parameter used as a key to identify the point from which an alert is issued; normally used by an upper-level system to select alerts to provide to a particular operator who covers a specific area of the plant
5	2005	MODE_BLK	Auto	Auto	Universal parameter that indicates the block operation conditions and is composed of the actual mode, target mode, permitted modes, and normal mode.
6	2006	BLOCK_ERR	—	—	Indicates the error statuses related to the block itself. The errors applicable to the transducer block of the YTA320 include: - Amplifier failure - Abnormal ambient temperature - O/S mode of transducer block
7	2007	UPDATE_EVT	—	—	Shows the contents of an update event upon occurrence.
8	2008	BLOCK_ALM	—	—	Shows the contents of an alarm event upon occurrence.
9	2009	TRANSDUCER _DIRECTORY	—	—	Index to the text describing the transducer contained in the YTA320 transmitter
10	2010	TRANSDUCER _TYPE	102	—	Transmitter type. Set to "102" (standard dual temperature with calibration) for the YTA320.
11	2011	XD_ERROR	—	—	Stores the error prioritized at the highest level from among the errors that are currently occurring in the transducer block. 0 = No error 34 = Stop Detection of Sensor Burnout (WARNING) 37 = Configuration Error 40 = Term Sensor Out of Range 45 = Term Sensor Failure 50 = Start Backup Mode 60 = Sensor2 Out of Range (WARNING) 62 = Sensor2 Signal Error 65 = Sensor2 Failure 70 = Sensor1 Out of Range (WARNING) 72 = Sensor1 Signal Error 75 = Sensor1 Failure 80 = Hardware Failure
12	2012	COLLECTION _DIRECTORY	—	—	Stores the item IDs in the DD corresponding to the indexes to critical parameters of the transducer block.

Relative Index	Index	Parameter Name	Default (factory setting)	Write	Description
13	2013	PRIMARY_VALUE _TYPE_1	104	Auto	Defines the type of primary value 1 (sensor 1 input). The following can be chosen for a YTA transmitter: 104 = Process temperature 105 = Non process temperature 112 = mV 200 = ohm
14	2014	PRIMARY_VALUE _1	—	—	Stores the value of the sensor 1 input.
15	2015	PRIMARY_VALUE _RANGE_1	Sensor range	—	Defines the upper and lower range limits and unit of PRIMARY_VALUE_1; differs depending on the sensor selected.
16	2016	CAL_POINT_HI_1	—	O/S	Upper value for calibrations of sensor 1 input.
17	2017	CAL_POINT_LO_1	—	O/S	Lower value for calibrations of sensor 1 input.
18	2018	CAL_MIN_SPAN_1	Minimum span	—	Minimum calibration span for sensor 1 input.
19	2019	CAL_UNIT_1	mV or ohm	—	Unit of calibration value for sensor 1. Set to "mV" for a thermocouple or mV input, or to "ohm" for an RTD or resistance input.
20	2020	SENSOR_TYPE_1	As specified by the customer before shipment	O/S	Type of sensor 1.
21	2021	SENSOR_RANGE_ 1	Range of sensor	—	Range of sensor 1.
22	2022	SENSOR_SN_1	—	O/S	Serial number of sensor 1.
23	2023	SENSOR_CAL _METHOD_1	103	Auto	Calibration method for sensor 1: 103 = Factory trim standard calibration 104 = User trim standard calibration
24	2024	SENSOR_CAL_ LOC _1	—	Auto	Shows and is used to record the location where sensor 1 was calibrated.
25	2025	SENSOR_CAL _DATE_1	—	Auto	Shows and is used to record the date when sensor 1 was calibrated.
26	2026	SENSOR_CAL _WHO_1	—	Auto	Shows and is used to record the person who calibrated sensor 1.
27	2027	SENSOR _ CONNECTION_1	As specified by the customer before shipment	O/S	Number of connection wires of sensor 1.
28	2028	PRIMARY_VALUE _TYPE_2	104	Auto	Defines the type of primary value 2 (sensor 2 input). The following can be chosen for a YTA transmitter: 104 = Process temperature 105 = Non process temperature 112 = mV 200 = ohm
29	2029	PRIMARY_VALUE_ 2	—	—	Stores the value of the sensor 2 input.
30	2030	PRIMARY_VALUE_ RANGE_2	Sensor range	—	Defines the upper and lower range limits and unit of PRIMARY_VALUE_2; differs depending on the sensor selected.
31	2031	CAL_POINT_HI_2	—	O/S	Upper value for calibrations of the sensor 2 input.
32	2032	CAL_POINT_LO_2	—	O/S	Lower value for calibrations of the sensor 2 input.
33	2033	CAL_MIN_SPAN_2	Minimum span	—	Minimum calibration span for the sensor 2 input.
34	2034	CAL_UNIT_2	mV or ohm	—	Unit of calibration value for sensor 2. Set to "mV" for a thermocouple or mV input, or to "ohm" for an RTD or resistance input.
35	2035	SENSOR_TYPE_2	As specified by the customer before shipment	O/S	Type of sensor 2.

Relative Index	Index	Parameter Name	Default (factory setting)	Write	Description
36	2036	SENSOR_RANGE_2	Range of sensor	—	Range of sensor 2.
37	2037	SENSOR_SN_2	—	Auto	Serial number of sensor 2.
38	2038	SENSOR_CAL_METHOD_2	103	Auto	Calibration method for sensor 2: 103 = Factory trim standard calibration 104 = User trim standard calibration
39	2039	SENSOR_CAL_LOC _2	—	Auto	Shows and is used to record the location where sensor 2 was calibrated.
40	2040	SENSOR_CAL _DATE_2	—	Auto	Shows and is used to record the date when sensor 2 was calibrated.
41	2041	SENSOR_CAL _WHO_2	—	Auto	Shows and is used to record the person who calibrated sensor 2.
42	2042	SENSOR _ CONNECTION_2	As specified by the customer before shipment	O/S	Number of connection wires of sensor 2.
43	2043	SECONDARY _VALUE	—	—	Indicates the terminal board temperature.
44	2044	SECONDARY VALUE_UNIT	°C	Auto	Unit of the terminal board temperature.
45	2045	MODULE_SN	Serial number	—	Serial number
46	2046	ALARM_SUM	Enable	—	Shows the alarm summary for the transducer block.
47	2047	PRIMARY_VALUE _FTIME_1	2 second	O/S	Time constant (in seconds) of the first-order lag filter applied to the sensor 1 input . (0 to 99)
48	2048	CAL_STATE_1	0 (User Cal Off)	O/S	Indicates the validity of user calibration for sensor 1: 0 =User Cal Off(Invalidate user-set calibration values) 1 = User Cal On(Validate user-set calibration values) 2 = Calibration Exec(User calibration mode)
49	2049	CJC_SELECT_1	0 (internal CJC)	O/S	Selects whether the terminal board temperature or user-set constant (CONSTANT_CJC_TEMP_1) is to be used for cold junction compensation (CJC) for the sensor 1 input. Valid for Thermocouple input only. 0=Internal CJC 1=Constant CJC
50	2050	CONSTANT_CJC _TEMP_1	—	O/S	User-set constant for CJC for the sensor 1 input. Setting 0 in this parameter disables RJC. Valid only when CJC_SELECT_1 is set to 1.
51	2051	WIRING _ RESISTANCE_1	0	O/S	Wiring resistance of the sensor 1 input. For a 2-wire resistance input, the input resistance minus this value is used as the temperature value.
52	2052	SENSOR_MATCH _R0_1	0	O/S	Value of the factor R0 used in the sensor matching function for the sensor 1 input
53	2053	SENSOR_MATCH _A_1	0	O/S	Value of the factor A used in the sensor matching function for the sensor 1 input
54	2054	SENSOR_MATCH _B_1	0	O/S	Value of the factor B used in the sensor matching function for the sensor 1 input
55	2055	SENSOR_MATCH _C_1	0	O/S	Value of the factor C used in the sensor matching function for the sensor 1 input
56	2056	SENSOR_MATCH _ALPHA_1	0	O/S	Value of the factor α used in the sensor matching function for the sensor 1 input
57	2057	SENSOR_MATCH _DELTA_1	0	O/S	Value of the factor δ used in the sensor matching function for the sensor 1 input

Relative Index	Index	Parameter Name	Default (factory setting)	Write	Description
58	2058	SENSOR_MATCH _BETA_1	0	O/S	Value of the factor ß used in the sensor matching function for the sensor 1 input
59	2059	PRIMARY_VALUE _FTIME_2	2 second	O/S	Time constant (in seconds) of the first-order lag filter applied to the sensor 2 input
60	2060	CAL_STATE_2	0 (User Cal Off)	O/S	Indicates the validity of user calibration for sensor 2: 0 =User Cal Off(Invalidate user-set calibration values) 1 = User Cal On(Validate user-set calibration values) 2 = Calibration Exec(User calibration mode)
61	2061	CJC_SELECT_2	0 (internal CJC)	O/S	Selects whether the terminal board temperature or user-set constant (CONSTANT_CJC_TEMP_2) is to be used for cold junction compensation (CJC) for the sensor 2 input. Valid for Thermocouple input only. 0=Internal CJC 1=Constant CJC
62	2062	CONSTANT_CJC _TEMP_2	0	O/S	User-set constant for CJC for the sensor 2 input. Setting 0 in this parameter disables RJC. Valid only when CJC_SELECT_2 is set to 1.
63	2063	WIRING _ RESISTANCE_2	0	O/S	Wiring resistance of the sensor 2 input. For a 2-wire resistance input, the input resistance minus this value is used as the temperature value.
64	2064	SENSOR_MATCH _R0_2	—	O/S	Value of the factor R0 used in the sensor matching function for the sensor 2 input
65	2065	SENSOR_MATCH _A_2	—	O/S	Value of the factor A used in the sensor matching function for the sensor 2 input
66	2066	SENSOR_MATCH _B_2	—	O/S	Value of the factor B used in the sensor matching function for the sensor 2 input
67	2067	SENSOR_MATCH _C_2	—	O/S	Value of the factor C used in the sensor matching function for the sensor 2 input
68	2068	SENSOR_MATCH _ALPHA_2	—	O/S	Value of the factor α used in the sensor matching function for the sensor 2 input
69	2069	SENSOR_MATCH _DELTA_2	—	O/S	Value of the factor δ used in the sensor matching function for the sensor 2 input
70	2070	SENSOR_MATCH _BETA_2	—	O/S	Value of the factor ß used in the sensor matching function for the sensor 2 input
71	2071	SECONDARY _VALUE_FTIME	0	O/S	Time constant (in seconds) of the first-order lag filter applied to the terminal board temperature input. (0 to 99)
72	2072	DIFFERENTIAL _VALUE	—	—	Indicates the difference between the two inputs.
73	2073	DIFFERENTIAL _UNIT	°C	Auto	Unit of the value of DIFFERENTIAL_VALUE
74	2074	DIFFERENTIAL _VALUE_FTIME	2 second	O/S	Time constant (in seconds) of the first-order lag filter applied to DIFFERENTIAL_VALUE (0 to 99)
75	2075	AVERAGE_VALUE	—	—	Indicates the average of the two inputs.
76	2076	AVERAGE_UNIT	°C	Auto	Unit of the value of AVERAGE_VALUE
77	2077	AVERAGE_VALUE _FTIME	2 second	O/S	Time constant (in seconds) of the first-order lag filter applied to AVERAGE_VALUE (0 to 99)
78	2078	BACKUP_VALUE	—	—	Indicates the value of the sensor 1 input normally, and the value of sensor 2 in case of burnout of sensor 1.
79	2079	BACKUP_UNIT	°C	Auto	Unit of the value of BACKUP_VALUE

Relative Index	Index	Parameter Name	Default (factory setting)	Write	Description
80	2080	BACKUP_ RETURN_ SENSOR1	0 (DISABLE)	O/S	Setting 1 in this parameter switches the value to be output from the sensor 2 input back to the sensor 1 input: 0 = DISABLE 1 = ENABLE
81	2081	SENSOR_ BURNOUT_ DETECT	0 (on)	O/S	Switches on and off the sensor burnout detection: 0 = On 1 = Off In most cases, this parameter should be set to 0(ON). If this is set to OFF, the sensor burnout detecting function will not correctly work.
82	2082	LIMSW_1_VALUE_ D	—	—	Indicates the value and status of limit switch 1.
83	2083	LIMSW_1_TARGET	0	O/S	Value to be monitored by limit switch 1: 0 = PRIMARY_VALUE_1 1 = PRIMARY_VALUE_2 2 = SECONDARY_VALUE 3 = DIFFERENTIAL_VALUE 4 = AVERAGE_VALUE 5 = BACKUP_VALUE
84	2084	LIMSW_1 _SETPOINT	0	O/S	Threshold of switching on limit switch 1
85	2085	LIMSW_1_ACT _DIRECTION	0 (high-limit switch)	O/S	Type of limit switch 1: 0 = HI LIMIT (high-limit switch) 1 = LO LIMIT (low-limit switch)
86	2086	LIMSW_1 _HYSTERESIS	0	O/S	Hysteresis of limit switch 1. Input of only a positive number is valid.
87	2087	LIMSW_1_UNIT	—	—	Unit of LIMSW_1_SETPOINT and LIMSW_1_ HYSTERESIS
88	2088	LIMSW_2_VALUE_ D	—	—	Indicates the value and status of limit switch 2.
89	2089	LIMSW_2_TARGET	0	O/S	Value to be monitored by limit switch 2. The setting and the corresponding value are the same as those for limit switch 1 (LIMSW_1_ TARGET).
90	2090	LIMSW_2 _SETPOINT	0	O/S	Threshold of switching on limit switch 2
91	2091	LIMSW_2_ACT_ DIRECTION	0 (high-limit switch)	O/S	Type of limit switch 2. The setting and the corresponding type are the same as those for limit switch 1 (LIMSW_1_ACT_DIRECTION).
92	2092	LIMSW_2 _HYSTERESIS	0	O/S	Hysteresis of limit switch 2. Input of only a positive number is valid.
93	2093	LIMSW_2_UNIT	—	—	Unit of LIMSW_2_SETPOINT and LIMSW_2_ HYSTERESIS
94	2094	LIMSW_3_VALUE_ D	—	—	Indicates the value and status of limit switch 3.
95	2095	LIMSW_3_TARGET	0	O/S	Value to be monitored by limit switch 3. The setting and the corresponding value are the same as those for limit switch 1 (LIMSW_1_ TARGET).
96	2096	LIMSW_3 _SETPOINT	0	O/S	Threshold of switching on limit switch 3
97	2097	LIMSW_3_ACT _DIRECTION	0 (high-limit switch)	O/S	Type of limit switch 3. The setting and the corresponding type are the same as those for limit switch 1 (LIMSW_1_ACT_DIRECTION).
98	2098	LIMSW_3 _HYSTERESIS	0	O/S	Hysteresis of limit switch 3. Input of only a positive number is valid.
99	2099	LIMSW_3_UNIT	—	—	Unit of LIMSW_3_SETPOINT and LIMSW_3_ HYSTERESIS

Relative Index	Index	Parameter Name	Default (factory setting)	Write	Description
100	2100	LIMSW_4_VALUE_D	—	—	Indicates the value and status of limit switch 4.
101	2101	LIMSW_4_TARGET	0	O/S	Value to be monitored by limit switch 4. The setting and the corresponding value are the same as those for limit switch 1 (LIMSW_1_TARGET).
102	2102	LIMSW_4_SETPOINT	0	O/S	Threshold of switching on limit switch 4
103	2103	LIMSW_4_ACT_DIRECTION	0 (high-limit switch)	O/S	Type of limit switch 4. The setting and the corresponding type are the same as those for limit switch 1 (LIMSW_1_ACT_DIRECTION).
104	2104	LIMSW_4_HYSTERESIS	0	O/S	Hysteresis of limit switch 4. Input of only a positive number is valid.
105	2105	LIMSW_4_UNIT	—	—	Unit of LIMSW_4_SETPOINT and LIMSW_4_HYSTERESIS
106	2106	DISPLAY_AI_OUT	0 (AI1 only)	Auto	Selects the AI block or blocks whose values are to be displayed on the LCD: 0 = AI1 1 = AI2 2 = AI3 3 = AI4 4 = AI1, AI2 5 = AI1, AI2, AI3 6 = AI1, AI2, AI3, AI4
107	2107	DISPLAY_ERROR	0 (SHOW)	Auto	Whether to display error codes on the LCD: 0 = SHOW 1 = INHIBIT
108	2108	DISPLAY_WARNING	1 (INHIBIT)	Auto	Whether to display warning codes on the LCD: 0 = SHOW 1 = INHIBIT
109	2109	DISPLAY_ADDRESS	1 (INHIBIT)	Auto	Whether to display the device address on the LCD: 0 = SHOW 1 = INHIBIT
110	2110	DISPLAY_CYCLE	2	Auto	Display refresh cycle (2 to 255 seconds)
111	2111	WARNING_ENABLE _1	Depends on the specification upon shipment	Auto	Switches on and off generation of warnings corresponding to DEVICE_STATUS_5 of the resource block.
112	2112	WARNING_ENABLE _2	Depends on the specification upon shipment	Auto	Switches on and off generation of warnings corresponding to DEVICE_STATUS_6 of the resource block.
113	2113	WARNING_ENABLE _3	Depends on the specification upon shipment	Auto	Switches on and off generation of warnings corresponding to DEVICE_STATUS_7 of the resource block.
114	2114	WARNING_ENABLE _4	Depends on the specification upon shipment	Auto	Switches on and off generation of warnings corresponding to DEVICE_STATUS_8 of the resource block.
115	2115	MODEL	YTA320	—	Model code of the transmitter
116	2116	YTA_OPTION	Depends on the specification upon shipment	—	Option of the transmitter

A1.5 Unit and Code

Unit	Code
K	1000
°C	1001
°F (Note)	1002
°R (Note)	1003
mV	1243
ohm	1281

Note : Available only when option /D2 is specified.

Appendix 2. Parameters for Basic Settings, and How to Make and Change the Settings

A2.1 Basic Settings and Corresponding Parameters

To Do This	Corresponding Parameters	Outline of Procedure
Set the tag numbers	—	Set the physical device tag number and each block's tag number. Up to 32 alphanumeric characters can be set for each. See Section 5.4 for details.
Make input sensor settings	SENSOR_TYPE_1 SENSOR_CONNECTION_1 SENSOR_TYPE_2 SENSOR_CONNECTION_2 in the transducer block	Select the input sensor type and set the number of connection wires, for each of sensors 1 and 2.
Set up a limit switch	LIMSW_1_TARGET LIMSW_1_SETPOINT in the transducer block	For limit switch 1, select the temperature to be monitored, select the switch type (high-limit or low-limit switch), and set the hysteresis and threshold.
Select inputs to AI and DI blocks	CHANNEL in each of AI and DI blocks	Select an output of the transducer block to be input to each of the AI and DI blocks.
Set the measurement ranges	XD_SCALE in each AI block	For each AI block, set the range of the input from the transducer block corresponding to 0% and 100% input levels for the calculation inside the AI block. Before the transmitter is shipped from the factory, these input range limits are set to the 0% and 100% range values specified by the customer when ordered. Set 3 data items: the unit of the input range, input value at 0% input level (lower limit of calibrated range), and input value at 100% input level (upper limit of calibrated range).
Set output scales and unit	OUT_SCALE in each AI block	For each AI block, set the output scale corresponding to 0% and 100% output levels for the calculation inside the AI block. A different unit and range from those of the calibrated range can be set by using the scaling calculation inside the block. Set 3 data items: the unit of the output scale, output value at 0% output level (lower output scale limit), and output value at 100% output level (upper output scale limit).
Set the scale range and unit of built-in indicator	[L_TYPE= Indirect/Indirect SQRT] OUT_SCALE in the AI block or each of the AI blocks whose outputs are to be indicated [L_TYPE= Direct] XD_SCALE In the AI block or each of the AI blocks whose outputs are to be indicated	When output mode L_TYPE is set to Indirect or Indirect SQRT, the scales and units set in OUT_SCALE's above apply to those of the indicator. When output mode L_TYPE is set to Direct, the scales and units set in XD_SCALE's above apply to those of the indicator. The value to be displayed is within a range from −9999.9 to 9999.9.
Set the output modes	L_TYPE in each AI block	Select the type of calculation performed in each AI block from the following. **Direct:** Outputs the value input from the transducer block through filtering without performing the scaling and square root extraction. **Indirect:** Performs proportional scaling for the value input from the transducer block through filtering, and then outputs the result. **IndirectSQRT:** Extracts the square root of the value input from the transducer block through filtering, and then outputs it.

To Do This	Corresponding Parameters	Outline of Procedure
Set the output cut-off levels	LOW_CUT in each AI block	For each AI block, set the output cut-off level suitable for the L_TYPE setting (= Direct, Indirect, or IndirectSQRT). The output value will be cut off to 0 when it is below the value set in LOW_CUT.
Set the time constants of damping filters	PV_FTIME of each of AI and DI blocks	For each AI block, set the time constant (in seconds) of the first-order lag filter. For each DI block, set the delay time in seconds.
Carry out simulations for AI and DI blocks	SIMULATE in each AI block SIMULATE_D in each DI block	Manually set input values and statuses for AI and DI blocks; the blocks then carry out the specified actions with the simulated input signals. This simulation function is useful for loop checks and so on. See Section 6.3 for details.
Make LCD display settings	DISPLAY_AI_OUT DISPLAY_CYCLE in the transducer block	Select the AI blocks whose output values you want to display on the LCD and set the display refresh cycle. If the response of the LCD is slow such as when used in a cold place, the display refresh cycle needs to be adjusted.
Carry out an input calibration	CAL_POINT_HI CAL_POINT_LO in the transducer block	Apply an input signal, vary the input signal level, and set the upper and lower range limits corresponding to the 0% and 100% input levels. The output range can be set accurately to the exact output signal levels generated by the user's reference instrument.

A2.2 Making and Changing Basic Parameter Settings

The figure below outlines the procedure to make basic parameter settings and change them.

The method of accessing each parameter differs depending on the configuration tool you use;

see the documentation for the configuration tool.

Access the parameter MODE_BLK in the function block containing the parameter whose settings you want to make or change.

↓

Set the target mode(Note 1) in MODE_BLK to a mode (Auto, Man, or O/S(Note 2)) in which write access to the desired parameter is permitted.

↓

Access the desired parameter.

↓

Change the settings as appropriate.

↓

Return the target mode in MODE_BLK to Auto. (Note 2)

IMPORTANT

Do not turn off the power to the YTA320 transmitter immediately after changing the parameter settings.
If the power is turned off within 60 seconds after making a change, the change is not saved and the previous setting is restored.

Note 1: MODE_BLK is a universal parameter that indicates the block operation conditions and is composed of actual mode, target mode, permitted modes, and normal mode.
Target: Used to set the mode that the block should enter.
Actual: Indicates the current mode of the block.
Permit: Indicates all modes that the block can enter.
Normal: Indicates the mode in which the block should be normally.

Note 2: The modes each block can enter are as follows.

Mode	AI Block	DI Block	Transducer Block	Resource Block
AUTO (automatic)	✓	✓	✓	✓
MAN (manual)	✓	✓		
O/S (out of service)	✓	✓	✓	✓

For the modes in which each parameter can be written, see Appendix 1.

A2.3 Setting Up the Transducer Block

To access the transducer's functions specific to the YTA320, the Device Description (DD) for the YTA320 needs to be installed in the configuration tool you use. For details on how to install the DD, see Section 4.4.

(1) Making the Input Sensor Settings

Access the parameter SENSOR_TYPE_1 and set the type of sensor to be connected as sensor 1.

↓

Access the parameter SENSOR_CONNECTION_1 and set the number of connection wires of the sensor to be connected as sensor 1 as follows:

- 2: For a 2-wire sensor, such as a thermocouple, voltage input, 2-wire RTD, and 2-wire resistance input
- 3: For a 3-wire sensor, such as a 3-wire RTD and 3-wire resistance input
- 4: For a 4-wire sensor, such as a 4-wire RTD and 4-wire resistance input

Do the same as above for the sensor 2 input.

When connecting a 4-wire sensor to the sensor input 1, sensor input 2 is not available. Set SENSOR_TYPE_2 to Non-Connection.

IMPORTANT

4-wire sensor cannot be assigned to Sensor 2.

(2) Setting Up Limit Switches

Set up limit switches 1 to 4. The values and statuses of limit switches can be read as outputs of DI blocks. The chart below outlines the procedure to set up limit switch 1.

Access the parameter LIMSW_1_TARGET and select the value to be monitored by limit switch 1:

- 0 = PRIMARY_VALUE_1 (sensor 1 input)
- 1 = PRIMARY_VALUE_2 (sensor 2 input)
- 2 = SECONDARY_VALUE (terminal board temperature)
- 3 = DIFFERENTIAL_VALUE (temperature difference between sensor 1 and 2 inputs)
- 4 = AVERAGE_VALUE (average temperature of sensor 1 and 2 inputs)
- 5 = BACKUP_VALUE (backup input)

↓

Access the parameter LIMSW_1_ACT_DIRECTION and select the type of limit switch 1:

- 0 = HI LIMIT (high-limit switch)
- 1 = LO LIMIT (low-limit switch)

↓

Access the parameter LIMSW_1_SETPOINT and set the threshold of turning on limit switch 1. As necessary, the hysteresis can be set in the parameter LIMSW_1_HYSTERESIS (input of only a positive number is valid).

Do the same for limit switches 2 to 4 as necessary.

(3) Making LCD Display Settings

Select the AI blocks whose output values you want to display on the LCD and set the display refresh cycle. The parameters related to LCD display settings include those that determine whether to hide the error and warning codes from the LCD, and enable and disable the address indications.

Access the parameter DISPLAY_AI_OUT and set a number to select the AI blocks whose output values you want to display on the LCD. When two or more AI blocks are selected, their outputs are displayed in turn cyclically.

- 0 = Display the output of AI1
- 1 = Display the output of AI2
- 2 = Display the output of AI3
- 3 = Display the output of AI4
- 4 = Display the outputs of AI1 and AI2
- 5 = Display the outputs of AI1, AI2, and AI3
- 6 = Display the outputs of AI1, AI2, AI3, and AI4

↓

Access the parameter DISPLAY_CYCLE and set the desired display cycle from 2 to 255 seconds. DISPLAY_CYCLE is set to 2 seconds by default. Increase the setting as appropriate such as when the response of the LCD is slow due to a cold ambient temperature.

(4) Carrying Out Input Calibration

Since the YTA320 is calibrated at the factory before shipment, calibration need not be performed after delivery; however, the user can carry out a calibration by applying arbitrary input levels as appropriate. For a thermocouple input, cold junction compensation is performed for the input level. To carry out a precise calibration, follow the procedure below to switch off the CJC prior to calibration. After the calibration, be sure to switch back on the CJC. This CJC switching procedure is not necessary for inputs other than a thermocouple.

Access the parameter CJC_SELECT_1 and set 1.

- 0 = Cold junction compensation based on the terminal board temperature
- 1 = Cold junction compensation based on a constant

↓

Access the parameter CONSTANT_CJC_TEMP_1 and set 0 (disable CJC).

This disables CJC for the sensor 1 input. After calibration, return the CJC_SELECT_1 setting to 0. The following outlines the calibration procedure for the sensor 1 input. Do the same for the sensor 2 input.

Access the parameter CAL_STATE_1 and set 2.
0 = User Cal Off (Invalidate user-set calibration values)
1 = User Cal On (Validate user-set calibration values)
2 = Calibration Exec (User calibration mode)

↓

Check that the sensor type and number of connection wires are set correctly for the sensor 1 input.
Refer to Table 5.16 in Section 5.6.4, "Parameters of Transducer Block," and apply the low level voltage or resistance appropriate for the sensor type, to the input terminals for the sensor 1 input.

↓

Access the parameter CAL_POINT_LO_1, and write the voltage or resistance value that is currently applied.

↓

Vary the input voltage or resistance to a high level appropriate for the sensor type.

↓

Access the parameter CAL_POINT_HI_1, and write the voltage or resistance value that is currently applied.

↓

Access the parameter CAL_STATE_1 and return the setting to 1 (validate the user-set calibration values).

IMPORTANT

While adjusting one input, connect the correct sensor to the other input. If you do not connect a sensor to the other input, set 'No Connection' to the sensor type.

(5) Setting Up the Sensor Matching Function

The sensor matching function is applicable to Pt100, Pt200, and Pt500 sensors only. The YTA320 employs the temperature-to-resistance characteristics of RTDs stipulated by IEC Publication 751-1995, which permits ranges of variations for each sensor type, causing measurement errors. The sensor matching function allows you to program each sensor's inherent constants called Callendar-Van Dusen constants, in the transmitter, and reduces those errors to improve the temperature measurement accuracy.

The resistance value of an RTD and the temperature t have the following relation:

$$Rt = R0\{1 + \alpha(1 + 0.01\delta)t - \alpha \cdot \delta/10^4 t^2 - a \cdot \beta/10^8(t - 100)t^3\} \quad \text{(Eq. 1)}$$

where

Rt = resistance (Ω) at temperature t (°C)

$R0$ = inherent constant of the sensor =resistance (Ω) at 0°C

α = inherent constant of the sensor

δ = inherent constant of the sensor

β = inherent constant of the sensor (= 0 if t > 0°C)

The precise values of *R0*, α, δ, and β can be obtained by measuring the characteristics of each RTD at several temperatures. This relation is also expressed by a different equation using inherent constants R0, A, B, and C as shown below.

$$Rt = R0\{1 + A \cdot t + B \cdot t^2 + C(t - 100)t^3\} \quad \text{(Eq. 2)}$$

where

Rt = resistance (Ω) at temperature t (°C)

$R0$ = inherent constant of the sensor = resistance (Ω) at 0°C

A = inherent constant of the sensor

B = inherent constant of the sensor

C = inherent constant of the sensor (= 0 if t > 0°C)

Equations 1 and 2 are equivalent to each other, and the YTA320 can handle either equation and allows you to specify either the values of α, δ, and β, or the values of *A*, *B*, and *C*.

The following shows the procedure to set up the sensor matching function for sensor 1 by entering the values of α, δ, and β for example. Also perform the setup for sensor 2, if connected, in the same way.

Access the parameter SENSOR_TYPE_1 and set 204 (sensor match). Then, access the parameter SENSOR_CONNECTION_1 and set the number of connection wires for the RTD used.

↓

Access the parameter SENSOR_MATCH_R0_1 and set the resistance of the RTD at 0°C.

↓

Access the parameters SENSOR_MATCH_ALPHA_1, SENSOR_MATCH_DELTA_1, and SENSOR_MATCH_BETA_1 and set the values of the sensor-inherent constants α, δ, and β, respectively.

A2.4 Setting Up AI Blocks

AI blocks are used to perform temperature output processing. Since each of the four AI blocks in a YTA320 has independent parameters, set the parameters for each AI block you use. The following shows the procedure to set up the AI1 block for example.

(1) Setting the Channel

Select the value to be input from the transducer block.

Access the parameter CHANNEL, and set the number corresponding to the value you want to input.
- 1 = PRIMARY_VALUE_1(Sensor 1 input)
- 2 = PRIMARY_VALUE_2(Sensor 2 input)
- 3 = SECONDARY_VALUE (Terminal board temperature)
- 4 = DIFFERENTIAL_VALUE (Temperature difference between sensors 1 and 2)
- 5 = AVERAGE_VALUE (Average temperature of sensors 1 and 2)
- 6 = BACKUP_VALUE (Backup temperature)

(2) Setting the Measurement Range

Access the parameter XD_SCALE, and do the following:
- Set the upper range limit for EU at 100% inside XD_SCALE.
- Set the lower range limit for EU at 0%.
- Set the code of the desired unit for Units Index.

For example, to measure a 0 to 200°C temperature, set:

- 200 for **EU at 100%** in XD_SCALE.
- 0 for **EU at 0%** in XD_SCALE.
- 1001 for **Units Index** in XD_SCALE (see notes below).

Note 1: For the unit, set the four-digit number code that represents the index to the desired unit. See Table A1.5 for the correspondence between the four-digit number codes and units.
Note 2: Set the same unit for the AI block as that set for the transducer block.

(3) Setting the Output Scale

Access the parameter OUT_SCALE, and do the following:
- Set the output value corresponding to the upper measurement range limit for **EU at 100%** inside OUT_SCALE.
- Set the output value corresponding to the lower measurement range limit for **EU at 0%**.
- Set the code of the desired unit for **Units Index**.

For example, to set the output range to 0 to 100%, set:

- 100 for **EU at 100%** in OUT_SCALE.
- 0 for **EU at 0%** in OUT_SCALE.
- 1342 for **Units Index** in OUT_SCALE.

Limitation Imposed by Built-in LCD

For a YTA320 with a built-in LCD, the output scale settings in OUT_SCALE apply to the scale and unit of the indication on the LCD when the corresponding AI is selected to be displayed and the output mode (L_TYPE) is set to Indirect or IndirectSQRT. In this case, the upper and lower output values to be set for EU at 100% and EU at 0% inside OUT_SCALE must be numbers within a range of –9999.9 to 9999.9. (When L_TYPE is Direct, the unit set in XD_SCALE is displayed.)

The following units can be displayed on the LCD.

Display Unit	Unit Index
Kelvin	1000
°C	1001
°F (Note)	1002
°R (Note)	1003
mV	1243
ohm	1281
mA	1211
%	1342

Note: Available only when optional code /D2 is specified.

(4) Setting the Output Mode

Access the parameter L_TYPE, and set the output mode:
- 1 = Direct (direct output of input from transducer)
- 2 = Indirect (linear scaling)
- 3 = IndirectSQRT (square root extraction)

(5) Setting the Low Cut-off Level

Set the low cut-off level such that the output will be cut off to zero when it is below the low cut-off level.

Access the parameter LOW_CUT, and set the low cut-off level.

↓

Access the parameter IO_OPTS, and set **Low cutoff** to on (true). Resetting **Low cutoff** to off (false) disables the low cut-off function.

(6) Setting the Damping Time Constant

Access the parameter PV_FTIME, and set the time constant (in seconds) of the first-order lag filter.

(7) Carrying Out the Simulation

You can carry out a simulation for an AI block by manually setting the input value (within the measurement range) and status.

Access the **Simulate Status** component of the parameter SIMULATE, and set the code of the desired status to be set in simulation mode.

↓

Access the **Simulate En/Disable** component of the parameter SIMULATE, and enable or disable the simulation:
2 = Active
1 = Disable

↓

Access the **Simulate Value** component of the parameter SIMULATE, and set the desired value.

An AI block performs the specified actions using:

- Values of **Simulate Status** and **Simulate Value** in SIMULATE as its input value and status when the **Simulate En/Disable** value is 2.
- Values of **Transducer Status** and **Transducer Value** in SIMULATE as its input value and status when the **Simulate En/Disable** value is 1.

See Section 6.3 for further details of the simulation function.

A2.5 Setting Up DI Blocks

DI blocks are used to output limit switch signals from the transducer block. Since each of the four DI blocks in a YTA320 has independent parameters, set the parameters for each DI block you use. The following shows the procedure to set up the DI1 block for example.

(1) Setting the Channel

Specify the limit switch whose signal should be input from the transducer block.

Access the parameter CHANNEL, and set the number corresponding to the limit switch whose signal you want to input:
7 = LIMSW_1_VALUE_D (Limit switch 1)
8 = LIMSW_2_VALUE_D (Limit switch 2)
9 = LIMSW_3_VALUE_D (Limit switch 3)
10 = LIMSW_4_VALUE_D (Limit switch 4)

(2) Setting the Damping Time Constant

Access the parameter PV_FTIME, and set the delay time in seconds, which is the time period by which a change in output should be delayed after a change in input.

(3) Carrying Out the Simulation

You can carry out a simulation for a DI block by manually setting the input value (within the measurement range) and status.

Access the **Simulate Status** component of the parameter SIMULATE_D, and set the code of the desired status to be set in simulation mode.

↓

Access the **Simulate En/Disable** component of the parameter SIMULATE_D, and enable or disable the simulation:
2 = Active
1 = Disable

↓

Access the **Simulate Value** component of the parameter SIMULATE_D, and set the desired value.

A DI block performs the specified actions using:

- Values of **Simulate Status** and **Simulate Value** in SIMULATE_D as its input value and status when the **Simulate En/Disable** value is 2.
- Values of **Transducer Status** and **Transducer Value** in SIMULATE_D as its input value and status when the **Simulate En/Disable** value is 1.

See Section 6.3 for further details of the simulation function.

Appendix 3. Function Block Diagram

A3.1 AI Block Function Diagram

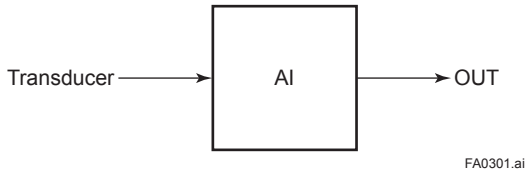


Figure A3.1 Signal Flow

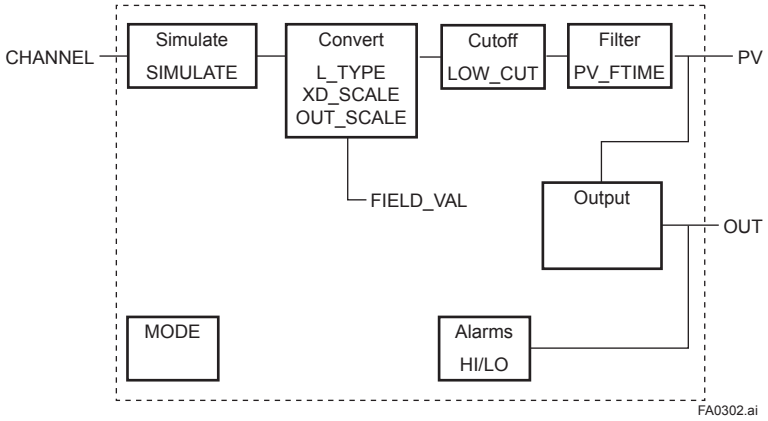


Figure A3.2 AI Block Diagram

A3.2 DI Block Function Diagram

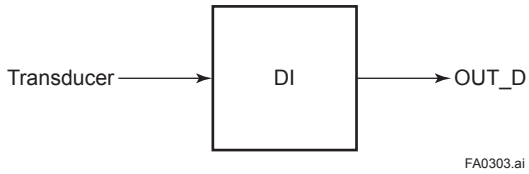


Figure A3.3 Signal Flow

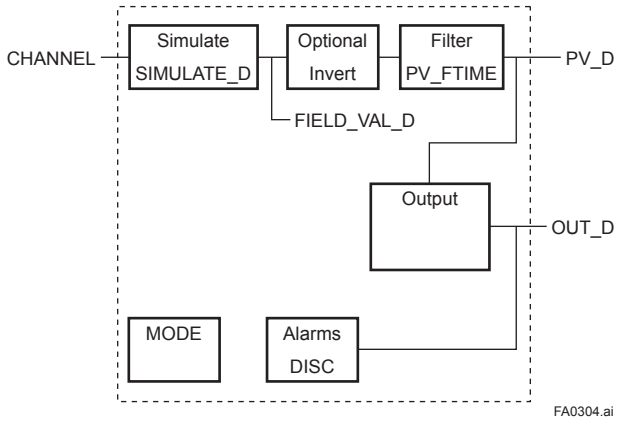


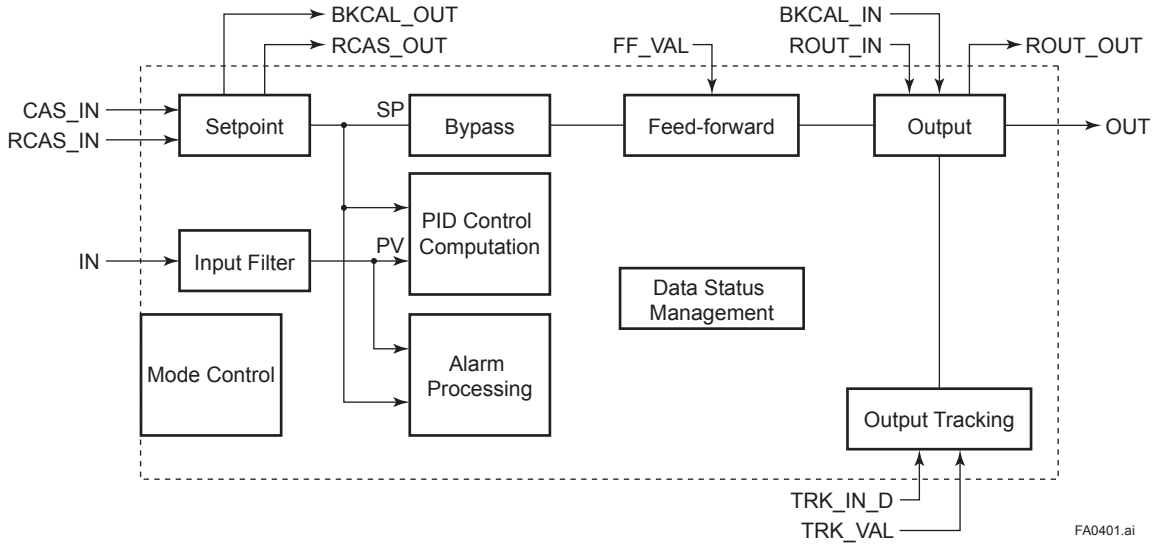
Figure A3.4 DI Block Diagram

Appendix 4. PID Block

A PID block performs the PID control computation based on the deviation of the measured value (PV) from the setpoint (SV), and is generally used for constant-setpoint and cascaded-setpoint control.

A4.1 Function Diagram

The figure below depicts the function diagram of a PID block.



A4.2 Functions of PID Block

The table below shows the functions provided in a PID block.

Function	Description
PID control computation	Computes the control output in accordance with the PID control algorithm.
Control output	Converts the change in control output ΔMV to the manipulated value MV that is to be actually output.
Switching of direction of control action	Switches over the direction of control action between direct and reverse, i.e., the direction of changes in the control output depending on the changes in the deviation.
Control action bypass	When the bypass is on, the value of the SP is scaled to the range of the OUT and output as the OUT.
Feed-forward	Adds the value of the FF_VAL (input to the PID block) to the output from the PID computation.
Measured-value tracking	Equalizes the setpoint SP to the measured value PV.
Setpoint limiters	Limit the value of setpoint SP within the preset upper and lower levels as well as limit the rate of change when the PID block is in Auto mode.
External-output tracking	Performs the scaling of the value of TRK_VAL to the range of the OUT and outputs it as the OUT.
Mode change	Changes the block mode between 8 modes: O/S, IMan, LO, Man, Auto, Cas, RCas, ROut.
Bumpless transfer	Prevents a sudden change in the control output OUT at changes in block mode and at switching of the connection from the control output OUT to the cascaded secondary function block.
Initialization and manual fallback	Changes the block mode to IMan and suspends the control action when the specified condition is met.
Manual fallback	Changes the block mode to Man and aborts the control action.
Auto fallback	Changes the block mode to Auto when it is Cas, and continues the control action with the setpoint set by the operator.
Mode shedding upon computer failure	Changes the block mode in accordance with the SHED_OPT setting upon a computer failure.
Alarm processing	Generates block alarms and process alarms, and performs event updates.

A4.3 Parameters of PID Block

NOTE: In the table below, the Write column shows the modes in which the respective parameters can be written. A blank in the Write column indicates that the corresponding parameter can be written in all modes of the PID block. A dash (-) indicates that the corresponding parameter cannot be written in any mode.

Index	Parameter Name	Default (factory setting)	Write	Valid Range	Description
0	Block Header	TAG: "PID"	Block Tag = O/S		Same as that for an AI block.
1	ST_REV		—		Same as that for an AI block.
2	TAG_DESC	(blank)			Same as that for an AI block.
3	STRATEGY	1			Same as that for an AI block.
4	ALERT_KEY	1		1 to 255	Same as that for an AI block.
5	MODE_BLK				
6	BLOCK_ERR		—		Same as that for an AI block.
7	PV		—		Measured value; the non-dimensional value that is converted from the input (IN) value based on the PV_SCALE values and filtered.
8	SP	0	AUTO	PV_SCALE ±10%	Setpoint
9	OUT		MAN		Output
10	PV_SCALE	100 0 1133 1	O/S		Upper and lower scale limit values used for scaling of the input (IN) value.
11	OUT_SCALE	100 0 1342 1	O/S		Upper and lower scale limit values used for scaling of the control output (OUT) value to the values in the engineering unit.
12	GRANT_DENY	0	AUTO		Same as that for an AI block.
13	CONTROL_OPTS	0	O/S		Setting for control action. See Section A4.13 for details.
14	STATUS_OPTS	0	O/S		See Section A4.15 for details.
15	IN	0			Controlled-value input
16	PV_FTIME	2	AUTO	Non-negative	Time constant (in seconds) of the first-order lag filter applied to IN
17	BYPASS	1 (off)	MAN	1, 2	Whether to bypass the control computation. 1 (off): Do not bypass. 2 (on): Bypass.
18	CAS_IN	0			Cascade setpoint
19	SP_RATE_DN	+INF		Positive	Rate-of-decrease limit for setpoint (SP)
20	SP_RATE_UP	-INF		Positive	Rate-of-increase limit for setpoint (SP)
21	SP_HI_LIM	100		PV_SCALE ±10%	Upper limit for setpoint (SP)
22	SP_LO_LIM	0		PV_SCALE ±10%	Lower limit for setpoint (SP)
23	GAIN	1			Proportional gain (= 100 / proportional band)
24	RESET	10			Integration time (seconds)
25	BAL_TIME	0		Positive	Unused
26	RATE	0		Positive	Derivative time (seconds)
27	BKCAL_IN	0			Read-back of control output
28	OUT_HI_LIM	100		OUT_SCALE ±10%	Upper limit for control output (OUT)
29	OUT_LO_LIM	0		OUT_SCALE ±10%	Lower limit for control output (OUT)
30	BKCAL_HYS	0.5 (%)		0 to 50%	Hysteresis for release from a limit for OUT. status
31	BKCAL_OUT	0	—		Read-back value to be sent to the BKCAL_IN in the upper block

Index	Parameter Name	Default (factory setting)	Write	Valid Range	Description
32	RCAS_IN	0			Remote setpoint set from a computer, etc.
33	ROUT_IN	0			Remote control output value set from a computer, etc.
34	SHED_OPT	0			Action to be performed in the event of mode shedding. SHED_OPT defines the changes to be made to MODE.BLK.target and MODE. BLK.actual when the value of RCAS_IN.status or ROUT_IN.status becomes Bad if .MODE_ BLK.actual = RCas or ROut. See Section A4.17.1 for details.
35	RCAS_OUT	0	—		Remote setpoint sent to a computer, etc.
36	ROUT_OUT	0	—		Remote control output value
37	TRK_SCALE	100 0 1342 1	MAN		Upper and lower scale limits used to convert the output tracking value (TRK_VAL) to non-dimensional.
38	TRK_IN_D	0			Switch for output tracking. See Section A4.12 for details.
39	TRK_VAL	0			Output tracking value (TRK_VAL) When MODE_BLK.actual = LO, the value scaled from the TRK_VAL value is set in OUT.
40	FF_VAL	0			Feedforward input value. The FF_VAL value is scaled to a value with the same scale as for OUT, multiplied by the FF_GAIN value, and then added to the output of the PID computation.
41	FF_SCALE	100 0 1342 1	MAN		Scale limits used for converting the FF_VAL value to a non-dimensional value.
42	FF_GAIN	0	MAN		Gain for FF_VAL
43	UPDATE_EVT		—		Same as that for an AI block.
44	BLOCK_ALM		—		Same as that for an AI block.
45	ALARM_SUM	Enable			Same as that for an AI block.
46	ACK_OPTION	0xffff			Same as that for an AI block.
47	ALARM_HYS	0.5%		0 to 50%	Hysteresis for alarm detection and resetting to prevent each alarm from occurring and recovering repeatedly within a short time.
48	HI_HI_PRI	0		0 to 15	Priority order of HI_HI_ALM alarm
49	HI_HI_LIM	+INF		PV_SCALE	Setting for HI_HI_ALM alarm
50	HI_PRI	0		0 to 15	Priority order of HI_ALM alarm
51	HI_LIM	+INF		PV_SCALE	Setting for HI_ALM alarm
52	LO_PRI	0		0 to 15	Priority order of LO_ALM alarm
53	LO_LIM	-INF		PV_SCALE	Setting for LO_ALM alarm
54	LO_LO_PRI	0		0 to 15	Priority order of LO_LO_ALM alarm
55	LO_LO_LIM	-INF		PV_SCALE	Setting for LO_LO_ALM alarm
56	DV_HI_PRI	0		0 to 15	Priority order of DV_HI_ALM alarm
57	DV_HI_LIM	+INF			Setting for DV_HI_ALM alarm
58	DV_LO_PRI	0		0 to 15	Priority order of DV_LO_ALM alarm
59	DV_LO_LIM	-INF			Setting for DV_LO_ALM alarm
60	HI_HI_ALM	—	—		Alarm that is generated when the PV value has exceeded the HI_HI_LIM value and whose priority order* is defined in HI_HI_PRI. * Priority order: Only one alarm is generated at a time. When two or more alarms occur at the same time, the alarm having the highest priority order is generated. When the PV value has decreased below [HI_HI_ LIM -ALM_HYS], HI_HI_ALM is reset.

Index	Parameter Name	Default (factory setting)	Write	Valid Range	Description
61	HI_ALM	—	—		As above
62	LO_ALM	—	—		As above Reset when the PV value has increased above [LO_LIM + ALM_HYS].
63	LO_LO_ALM	—	—		As above
64	DV_HI_ALM	—	—		Alarm that is generated when the value of [PV - SP] has exceeded the DV_HI_LIM value. Other features are the same as HI_HI_ALM.
65	DV_LO_ALM	—	—		Alarm that is generated when the value of [PV - SP] has decreased below the DV_LO_LIM value. Other features are the same as LO_LO_ALM.

A4.4 PID Computation Details

A4.4.1 PV-proportional and -derivative Type PID (I-PD) Control Algorithm

For PID control, the PID block in an YTA employs the PV-proportional and PV-derivative type PID control algorithm(referred to as the I-PD control algorithm) in Auto and RCas mode. The I-PD control algorithm ensures control stability against sudden changes in the setpoint, such as when the user enters a new setpoint value. At the same time, the I-PD algorithm ensures excellent controllability by performing proportional, integral, and derivative control actions in response to changes of characteristics in the controlled process, changes in load, and occurrences of disturbances. In Cas mode, PV derivative type PID control algorithm (referred to as the PI-D control algorithm) is employed in order to obtain better performance against the changes in the setpoint. The algorithm is automacially switched by the block according to the mode. A basic form of each algorithm is expressesd in the equation below.

I-PD Control Algorithm (in Auto / RCas mode)

$$\Delta MVn = K \{\Delta PVn + \frac{\Delta T}{Ti} (PVn - SPn) + \frac{Td}{\Delta T} \Delta(\Delta PVn)\}$$

PI-D Control Algorithm (in Cas mode)

$$\Delta MVn = K\{\Delta(PVn-SPn)+\frac{\Delta T}{Ti}(PVn-SPn)+\frac{Td}{\Delta T}\Delta(\Delta PVn)\}$$

Where,

ΔMVn = change in control output
ΔPVn = change in measured (controlled) value = PVn - PVn-1
ΔT = control period = period_of_execution in Block Header
K = proportional gain = GAIN (= 100/ proportional band)
Ti = integral time = RESET
Td = derivative time = RATE

The subscripts, n and n-1, represent the time of sampling such that PVn and PVn-1 denote the PV value sampled most recently and the PV value sampled at the preceding control period, respectively.

A4.4.2 PID Control Parameters

The table below shows the PID control parameters.

Parameter	Description	Valid Range
GAIN	Proportional gain	0.05 to 20
RESET	Integral time	0.1 to 10,000 (seconds)
RATE	Derivative time	0 to infinity (seconds)

A4.5 Control Output

The final control output value, OUT, is computed based on the change in control output ΔMVn, which is calculated at each control period in accordance with the aforementioned algorithm. The PID block in a YTA performs the velocity type output action for the control output.

A4.5.1 Velocity Type Output Action

The PID block determines the value of the new control output OUT by adding the change in control output calculated in the current control period, ΔMVn, to the current read-back value of the MV, MVRB (BKCAL_IN). This action can be expressed as:

OUT = BKCAL_IN – ΔMVn'

ΔMVn' = ΔMVn which is scaled by PV_SCALE and OUT_SCALE

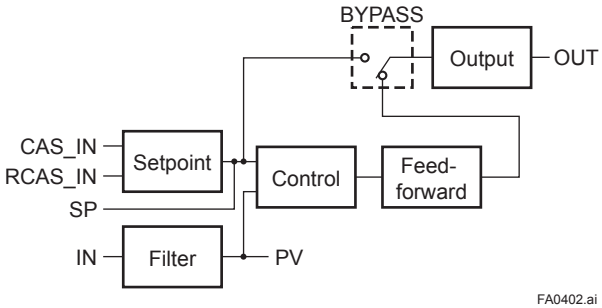
A4.6 Direction of Control Action

The direction of the control action is determined by the Direct Acting setting in CONTROL_OPTS.

Value of Direct Acting	Resulting Action
True	The output increases when the input PV is greater than the setpoint SP.
False	The output decreases when the input PV is greater than the setpoint SP.

A4.7 Control Action Bypass

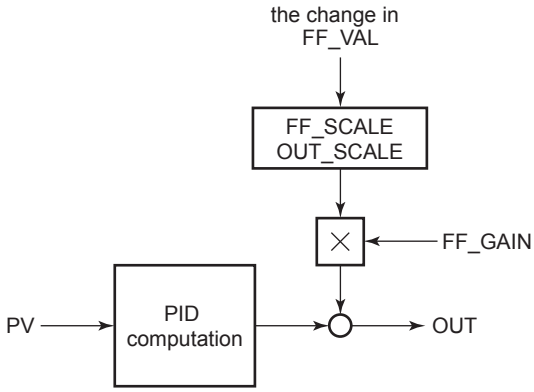
The PID control computation can be bypassed so as to set the SP value in the control output OUT as shown below. Setting BYPASS to “On” bypasses the PID control computation.



FA0402.ai

A4.8 Feed-forward

Feed-forward is an action to add a compensation output signal FF_VAL to the output of the PID control computation, and is typically used for feed-forward control. The figure below illustrates the action.



FA0403.ai

A4.9 Block Modes

The block mode is set in the parameter MODE-BLK.

MODE_ BLK	Target	Stipulates the target mode to which the PID block transfers.
	Actual	Indicates the current mode of the PID block.
	Permitted	Stipulates all the modes that the PID block can enter. The PID block is prohibited to enter any mode other than those set in this element.
	Normal	Stipulates the mode in which the PID block normally resides.

There are eight modes for a PID block as shown below.

Block Mode	Description
ROut	Remote output mode, in which the PID block outputs the value set in ROUT_IN.
RCas	Remote cascade mode, in which the PID block carries out the PID control computation based on the setpoint (SP) set via the remote cascade connection, such as from a computer, and outputs the computed result.
Cas	Cascade mode, in which the PID block carries out the PID control computation based on the setpoint (SP) set from another fieldbus function block, and outputs the computed result.
Auto	The PID block carries out automatic control and outputs the result computed by the PID control computation.
Man	Manual mode, in which the PID block outputs the value set by the user manually.
LO	The PID block outputs the value set in TRK_VAL.
IMan	Initialization and manual mode, in which the control action is suspended. The PID block enters this mode when the specified condition is met (see Section A4.14).
O/S	Out of service mode, in which neither the control computation nor action is carried out, and the output is kept at the value that was output before the PID block entered into O/S mode.

A4.9.1 Mode Transitions

Transition Destination Mode	Condition	NOT Conditions
O/S	1. If O/S is set in **MODE_ BLK.target** (or if O/S is set in **target** inside the resource block)	
IMan	2. If the specified condition is met (see Section A4.14)	**NOT** if condition 1 is met
LO	3. If Track Enable is specified in **CONTROL_ OPTS** and the value of **TRK_IN_D** is true	**NOT** if either or both of conditions 1 and 2 are met
Man	4. If Man is set in **MODE_ BLK.target** or if **IN.status** (input status) is Bad	**NOT** if any one or more of conditions 1 to 3 are met
Auto*	5. If Auto is set in **MODE_ BLK.target - AND -** if **IN.status** (input status) is not Bad	**NOT** if any one or more of conditions 1 to 3 are met
Cas*, **	6. If Cas is set in **MODE_ BLK.target - AND -** if neither **IN.status** (input status) nor **CAS_ IN.status is** Bad.	**NOT** if any one or more of conditions 1 to 3 are met
RCas*, **	7. If RCas is set in **MODE_ BLK.target - AND -** if neither **IN.status** (input status) nor **RCAS_ IN.status** is Bad.	**NOT** if any one or more of conditions 1 to 3 are met.
ROut*, **	8. If ROut is set in **MODE_ BLK.target - AND -** if **ROUT_IN.status** (input status) is not Bad	**NOT** if any one or more of conditions 1 to 3 are met.
In accordance with the **SHED_OPT** setting	9. **If RCAS_IN.status** or **ROUT_ IN.status** is Bad (indicating a computer failure; see Section A4.17.1 for details)	

* To activate mode transitions to Auto, Cas, RCas, and ROut, the respective target modes must be set beforehand to MODE_BLK.permitted.

** A transition to Cas, RCas, or ROut requires that initialization of the cascade connection has been completed.

A4.10 Bumpless Transfer

Prevents a sudden change in the control output OUT at changes in block mode (MODE_BLK) and at switching of the connection from the control output OUT to the cascaded secondary function block. The action to perform a bumpless transfer differs depending on the MODE_BLK values.

A4.11 Setpoint Limiters

Active setpoint limiters that limit the changes in the SP value, differ depending on the block mode as follows.

A4.11.1 When PID Block Is in Auto Mode

When the value of MODE_BLK is Auto, the four types of limiters are in force: high limit, low limit, rate-of-increase limit, and rate-of-decrease limit.

Setpoint High/Low Limits

- A value larger than the value of SP_HI_LIM cannot be set for SP.
- A value smaller than the value of SP_LO_LIM cannot be set for SP.

Setpoint Rate Limits

The setpoint rate limits are used to restrict the magnitude of changes in the SP value so as to change the SP value gradually towards a new setpoint.

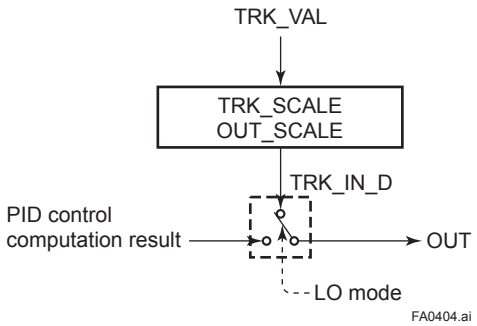
- An increase of the SP value at each execution period (period of execution in the Block Header) is limited to the value of SP_RATE_UP.
- A decrease of the SP value at each execution period (period of execution in the Block Header) is limited to the value of SP_RATE_DOWN.

A4.11.2 When PID Block Is in Cas or RCas Mode

By selecting Obey SP Limits if Cas or RCas in CONTROL_OPTS (see Section A4.13), the setpoint high/low limits can be put into force also when the value of MODE_BLK is Cas or RCas.

A4.12 External-output Tracking

External tracking is an action of outputting the value of the remote output TRK_VAL set from outside the PID block, as illustrated in the figure below. External tracking is performed when the block mode is LO.



To change the block mode to LO:

(1) Select Track Enable in CONTROL_OPTS.
(2) Set TRK_IN_D to true.

However, to change the block mode from Man to LO, Track in Manual must also be specified in CONTROL_OPTS.

A4.13 Measured-value Tracking

Measured-value tracking, also referred to as SP-PV tracking, is an action to equalize the setpoint SP to the measured value PV when the block mode (MODE_BLK.actual) is Man in order to prevent a sudden change in control output from being caused by a mode change to Auto.

While a cascade primary control block is performing the automatic or cascade control (in the Auto or Cas mode), when the mode of its secondary control block is changed from Cas to Auto, the cascade connection is opened and the control action of the primary block stops. The SP of the secondary controller can be equalized to its cascade input signal CAS_IN also in this case.

The settings for measured-value tracking are made in the parameter CONTROL_OPTS, as shown in the table below.

Options in CONTROL_OPTS	Description
Bypass Enable	This parameter allows BYPASS to be set.
SP-PV Track in Man	Equalizes SP to PV when **MODE_BLK.target** is set to Man.
SP-PV Track in ROut	Equalizes SP to PV when **MODE_BLK.target** is set to ROut.
SP-PV Track in LO or IMan	Equalizes SP to PV when actual is set to LO or IMAN.
SP-PV Track retained Target	Equalizes SP to RCAS_IN when **MODE_BLK.target** is set to RCas, and to CAS_IN when **MODE_BLK.target** is set to Cas when the actual mode of the block is IMan, LO, Man or ROut.
Direct Acting	Set the PID block to a direct acting controller.
Track Enable	This enables the external tracking function. The value in TRK_VAL will replace the value of OUT if TRK_IN_D becomes true and the target mode is not Man.
Track in Manual	This enables TRK_VAL to replace the value of OUT when the target mode is Man and TRK_IN_D is true. The actual mode will then be LO.
Use PV for BKCAL_OUT	Sets the value of PV in BKCAL_OUT and RCAS_OUT, instead of the value of SP.
Obey SP limits if Cas or RCas	Puts the setpoint high/low limits in force in the Cas or RCas mode.
No OUT limits in Manual	Disables the high/low limits for OUT in the Man mode.

A4.14 Initialization and Manual Fallback (IMan)

Initialization and manual fallback denotes a set of actions in which a PID block changes mode to IMan (initialization and manual) and suspends the control action. Initialization and manual fallback takes place automatically as a means of abnormality handling when the following condition is met:

- The quality component of BKCAL_IN.status is Bad.
  - OR -
- The quality component of BKCAL_IN.status is Good (c)
  - AND -
  The sub-status component of BKCAL_IN.status is FSA, LO, NI, or IR.

The user cannot manually change the mode to IMan. A mode transition to IMan occurs only when the condition above is met.

A4.15 Manual Fallback

Manual fallback denotes an action in which a PID block changes mode to Man and suspends the control action. Manual fallback takes place automatically as a means of abnormality handling when the following condition is met:

- IN.status is Bad except when the control action bypass is on.

To enable the manual fallback action to take place when the above condition is met, Target to Manual if BAD IN must be specified beforehand in STATUS_ OPTS.

The table below shows the options in STATUS_ OPTS.

Options in STATUS_ OPTS	Description
IFS if BAD IN	Sets the sub-status component of **OUT.status** to IFS if **IN.status** is Bad except when PID control bypass is on.
IFS if BAD CAS IN	Sets the sub-status component of **OUT.status** to IFS if **CAS_IN.status** is Bad.
Use Uncertain as Good	Does not regard **IN** as being in Bad status when **IN.status** is Uncertain (to prevent mode transitions from being affected when it is Uncertain).
Target to Manual if BAD IN	Automatically changes the value of **MODE_BLK.target** to MAN when **IN** falls into Bad status.
Target to next permitted mode if BAD CAS IN	Automatically changes the value of **MODE_BLK.target** to Auto (or to Man if Auto is not set in Permitted) when **CAS_IN** falls into Bad status.

A4.16 Auto Fallback

Auto fallback denotes an action in which a PID block changes mode from Cas to Auto and continues automatic PID control with the user-set setpoint. Auto fallback takes place automatically when the following condition is met:

- IN.status (data status of IN) is Bad except when the control action bypass is on.

To enable the manual fallback action to take place when the above condition is met:

- Target to next permitted mode if BAD CAS IN must be previously specified in STATUS_ OPTS.

  - AND -

- Auto must be previously set in MODE_BLK. permitted.

A4.17 Mode Shedding upon Computer Failure

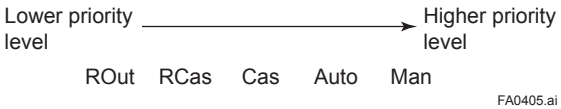
When the data status of RCAS_IN or ROUT_IN, which is the setting received from a computer as the setpoint SP, falls to Bad while the PID block is running in the RCas or ROut mode, the mode shedding occurs in accordance with the settings in SHED_OPT.

A4.17.1 SHED_OPT

The SHED_OPT setting stipulates the specifications of mode shedding as shown below. Only one can be set.

Available Setting for SHED_OPT	Actions upon Computer Failure
Normal shed, normal return	Sets **MODE_BLK.actual** to Cas*1, and leaves **MODE_BLK.target** unchanged.
Normal shed, no return	Sets both **MODE_BLK.actual** and **MODE_BLK.target** to Cas*1.
Shed to Auto, normal return	Sets **MODE_BLK.actual** to Auto*2, and leaves **MODE_BLK.target** unchanged.
Shed to Auto, no return	Sets both **MODE_BLK.actual** and M**ODE_BLK.target** to Auto*2.
Shed to Manual, normal return	Sets **MODE_BLK.actual** to Man, and leaves **MODE_BLK.target** unchanged.
Shed to Manual, no return	Sets both **MODE_BLK.actual** and **MODE_BLK.target** to Man.
Shed to retained target, normal return	If Cas is in **MODE_BLK.target**, sets **MODE_BLK.actual** to Cas*1, and leaves **MODE_BLK.target** unchanged. If Cas is not set in **MODE_BLK.target**, sets **MODE_BLK.actual** to Auto*2, and leaves **MODE_BLK.target** unchanged.
Shed to retained target, no return	If Cas is set in **MODE_BLK.target**, sets both **MODE_BLK.actual** and **MODE_BLK.target** to Cas*1. If Cas is not set in **MODE_BLK.target**, sets **MODE_BLK.actual** to Auto*2, and **MODE_BLK.target** to Cas.

*1 The modes to which a PID block can transfer are limited to those set in MODE_BLK. permitted, and the priority levels of modes are as shown below. In fact, if Normal shed, normal return is set for SHED_OPT, detection of a computer failure causes MODE_BLK.actual to change to Cas, Auto, or MAN, whichever is set in MODE_BLK. permitted and has the lowest priority level.



*2 Only when Auto is set as permitted mode.

NOTE: If a control block is connected as a cascade primary block of the PID block in question, a mode transition of the PID block to Cas occurs in the following sequence due to initialization of the cascade connection: RCas or ROut → Auto → Cas.

A4.18 Alarms

There are two kinds of alarms generated by a PID block: block and process alarms.

A4.18.1 Block Alarm (BLOCK_ALM)

The block alarm BLOCK_ALM is generated upon occurrence of either of the following errors (values set in BLOCK_ERR) and notifies the content of BLOCK_ERR.

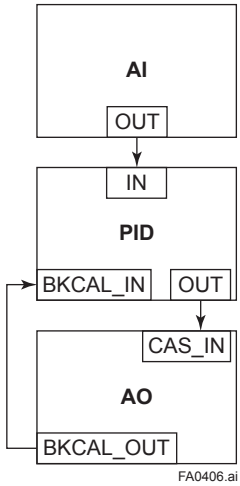
Value of BLOCK_ERR	Condition
Input Failure	**IN.status** of the PID block is either of the following: • Bad-Device Failure • Bad-Sensor Failure
Local Override	**MODE_BLK.actual** of the PID block is LO.
Out of Service	**MODE_BLK.target** of the PID block is O/S.

A4.18.2 Process Alarms

There are six types of process alarms. Only one process alarm can be generated at the same time, and the process alarm having the highest priority level from among those occurring at the same time is generated. The priority level is set for each process alarm type.

Process Alarm	Cause of Occurrence	Parameter Containing Priority Level Setting
HI_HI_ ALM	Occurs when the PV increases above the HI_HI_LIM value.	HI_HI_PRI
HI_ALM	Occurs when the PV increases above HI_LIM value.	HI_PRI
LO_ALM	Occurs when the PV decreases below the LO_LIM value.	LO_PRI
LO_LO_ ALM	Occurs when the PV decreases below the LO_LO_LIM value.	LO_LO_PRI
DV_HI_ ALM	Occurs when the value of [PV - SP] increases above the DV_HI_LIM value.	DV_HI_PRI
DV_LO_ ALM	Occurs when the value of [PV - SP] decreases below the DV_LO_LIM value.	DV_LO_PRI

A4.19 Example of Block Connections



When configuring a simple PID control loop by combining a YTA transmitter with a fieldbus valve positioner that contains an AO block, follow the procedure below to make the settings of the corresponding fieldbus function blocks:

1. Connect the AI block and PID block of the YTA, and the AO block of the valve positioner as shown above.
2. Set MODE_BLK.target of the PID block to O/S, and then set GAIN, RESET, and RATE to appropriate values.
3. Check that the value of MODE_BLK.actual of the AI block is Auto.
4. Set MODE_BLK.target of the AO block to CAS|AUTO (meaning "Cas and Auto").
5. Check that the value of BKCAL_IN.status of the PID block is not Bad.
6. Check that the value of IN.status of the PID block is not Bad.
7. Check that Auto is set in MODE_BLK.permitted of the PID block.
8. Set MODE_BLK.target of the PID block to Auto.

When finishing all steps in order, the PID block and AO block exchange the respective information and initialize the cascade connection. Consequently, the value of MODE_BLK.actual of the PID block changes to Auto and automatic PID control starts.

A4.19.1 View Object for PID Function Block

Relative Index	Parameter Mnemonic	VIEW 1	VIEW 2	VIEW 3	VIEW 4
1	ST_REV	2	2	2	2
2	TAG_DESC				
3	STRATEGY				2
4	ALERT_KEY				1
5	MODE_BLK	4		4	
6	BLOCK_ERR	2		2	
7	PV	5		5	
8	SP	5		5	
9	OUT	5		5	
10	PV_SCALE		11		
11	OUT_SCALE		11		
12	GRANT_DENY		2		
13	CONTROL_OPTS				2
14	STATUS_OPTS				2
15	IN			5	
16	PV_FTIME				4
17	BYPASS		1		
18	CAS_IN	5		5	
19	SP_RATE_DN				4
20	SP_RATE_UP				4
21	SP_HI_LIM		4		
22	SP_LO_LIM		4		
23	GAIN				4
24	RESET				4
25	BAL_TIME				4
26	RATE				4
27	BKCAL_IN			5	
28	OUT_HI_LIM		4		
29	OUT_LO_LIM		4		
30	BKCAL_HYS				4
31	BKCAL_OUT			5	
32	RCAS_IN			5	
33	ROUT_IN			5	
	Subtotals	28	43	53	41

Relative Index	Parameter Mnemonic	VIEW 1	VIEW 2	VIEW 3	VIEW 4
34	SHED_OPT				1
35	RCAS_OUT			5	
36	ROUT_OUT			5	
37	TRK_SCALE				11
38	TRK_IN_D	2		2	
39	TRK_VAL	5		5	
40	FF_VAL			5	
41	FF_SCALE				11
42	FF_GAIN				4
43	UPDATE_EVT				
44	BLOCK_ALM				
45	ALARM_SUM	8		8	
46	ACK_OPTION				2
47	ALARM_HYS				4
48	HI_HI_PRI				1
49	HI_HI_LIM				4
50	HI_PRI				1
51	HI_LIM				4
52	LO_PRI				1
53	LO_LIM				4
54	LO_LO_PRI				1
55	LO_LO_LIM				4
56	DV_HI_PRI				1
57	DV_HI_LIM				4
58	DV_LO_PRI				1
59	DV_LO_LIM				4
60	HI_HI_ALM				
61	HI_ALM				
62	LO_ALM				
63	LO_LO_ALM				
64	DV_HI_ALM				
65	DV_LO_ALM				
	Subtotals	15	0	30	63
	Totals	43	43	83	104

Appendix 5. Link Master Functions

A5.1 Link Active Scheduler

A link active scheduler (LAS) is a deterministic, centralized bus scheduler that can control communications on an H1 fieldbus segment. There is only one LAS on an H1 fieldbus segment.

A YTA supports the following LAS functions.

- PN transmission: Identifies a fieldbus device newly connected to the same fieldbus segment. PN is short for Probe Node.
- PT transmission: Passes a token governing the right to transmit, to a fieldbus device on the same segment. PT is short for Pass Token.
- CD transmission: Carry out a scheduled transmission to a fieldbus device on the same segment. CD is short for Compel Data.
- Time synchronization: Periodically transmits the time data to all fieldbus devices on the segment and returns the time data in response to a request from a device.
- Live list equalization: Sends the live list data to link masters on the same segment.
- LAS transfer: Transfers the right to be the LAS on the segment to another link master.

A5.2 Link Master

A link master (LM) is any device containing a link active scheduler. There must be at least one LM on a segment. When the LAS on a segment has failed, another LM on the same segment starts working as the LAS.

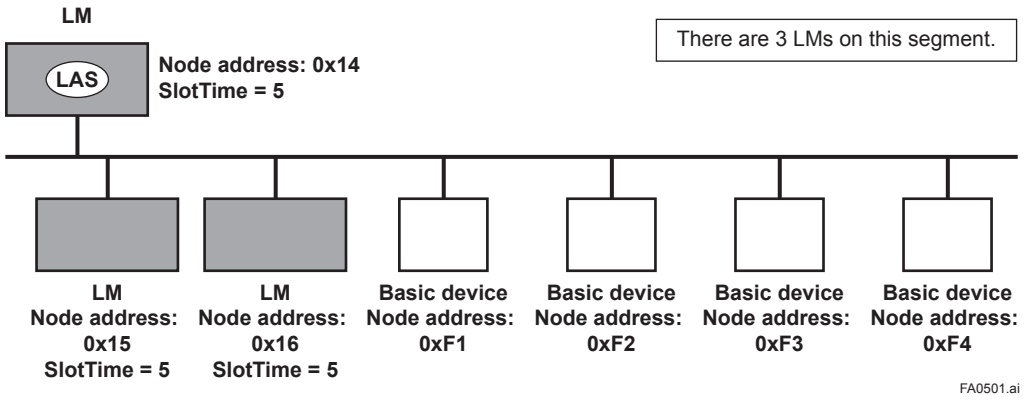


Figure 1. Example of Fieldbus configuration-3 LMs on Same Segment

A5.3 Transfer of LAS

There are two procedures for an LM to become the LAS:

- If the LM whose value of [V(ST)×V(TN)] is the smallest on a segment, with the exception of the current LAS, judges that there is no LAS on the segment, in such a case as when the segment has started up or when the current LAS has failed, the LM declares itself as the LAS, then becomes the LAS. (With this procedure, an LM backs up the LAS as shown in the following figure.)
- The LM whose value of [V(ST)×V(TN)] is the smallest on a segment, with the exception of the current LAS, requests the LAS on the same segment to transfer the right of being the LAS, then becomes the LAS.

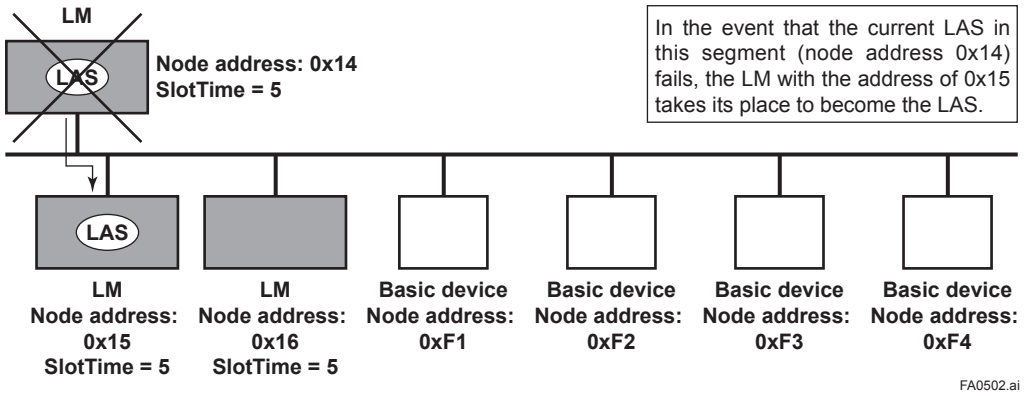

LM
LAS
Node address: 0x14
SlotTime = 5
In the event that the current LAS in this segment (node address 0x14) fails, the LM with the address of 0x15 takes its place to become the LAS.
LAS
LM Node address: 0x15 SlotTime = 5
LM Node address: 0x16 SlotTime = 5
Basic device Node address: 0xF1
Basic device Node address: 0xF2
Basic device Node address: 0xF3
Basic device Node address: 0xF4
FA0502.ai

Figure 2. Backup of LAS

To set up a YTA as a device that is capable of backing up the LAS, follow the procedure below.

NOTE: When changing the settings in a YTA, add the YTA to the segment in which an LAS is running. After making changes to the settings, do not turn off the power to the YTA for at least 60 seconds.

(1) Set the node address of the YTA. In general, use an address from 0x10 to [V(FUN) - 1].

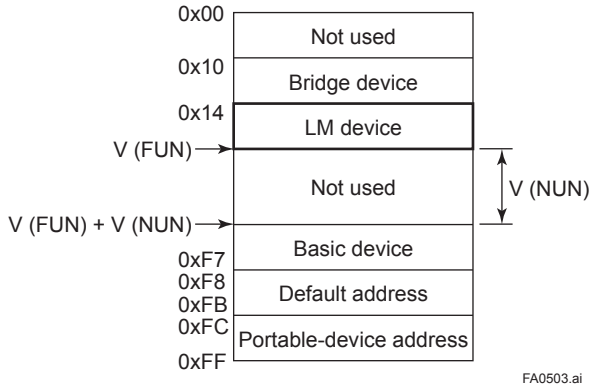


Figure 3. Node Address Ranges

(2) In the LAS settings of the YTA, set the values of V(ST), V(MRD), and V(MID) to the same as the respective lowest capability values in all the devices within the segment. An example is shown below.

DlmeBasicInfo (YTA Index 361 (SM))

Sub-index	Element	EJA	Device 1	Device 2	Device 3	Description
1	SlotTime	4	8	10	20	Capability value for V(ST)
3	MaxResponse Delay	3	6	3	5	Capability value for V(MRD)
6	MinInterPdu Delay	4	8	12	10	Capability value for V(MID)

In this case, set SlotTime, MaxResponseTime, and MinInterPduDelay as follows:

ConfiguredLinkSettingsRecord (YTA Index 369 (SM))

Subindex	Element	Setting (Default)	Description
1	SlotTime	20(4095)	V (ST)
3	MaxResponseDelay	6(5)	V (MRD)
6	MinInterPduDelay	12(12)	V (MID)

(3) In the LAS settings of the YTA, set the values of V(FUN) and V(NUN) so that they include the node addresses of all nodes within the same segment. (See also Figure 3.)

ConfiguredLinkSettingsRecord (YTA Index 369 (SM))

Sub-ndex	Element	Default Value	Description
4	FirstUnpolledNodeId	0x25	V (FUN)
7	NumConsecUnpolledNodeId	0xBA	V (NUN)

A5.4 LM Functions

No.	Function	Description
1	LM initialization	When a fieldbus segment starts, the LM with the smallest [V(ST) × V(TN)] value within the segment becomes the LAS. At all times, each LM is checking whether or not a carrier is on the segment.
2	Startup of other nodes (PN and Node Activation SPDU transmissions)	Transmits a PN (Probe Node) message, and Node Activation SPDU message to devices which return a new PR (Probe Response) message.
3	PT transmission (including final bit monitoring)	Passes a PT (Pass Token) message to devices included in the live list sequentially, and monitors the RT (Return Token) and final bit returned in reply to the PT.
4	CD transmission	Transmits a CD (Compel Data) message at the scheduled times.
5	Time synchronization	Supports periodic TD (Time Distribution) transmissions and transmissions of a reply to a CT (Compel Time).
6	Domain download server	Sets the schedule data. The schedule data can be equalized only when the Domain Download command is carried out from outside the LM in question. (The version of the schedule is usually monitored, but no action takes place, even when it changes.)
7	Live list equalization	Transmits SPDU messages to LMs to equalize live lists.
8	LAS transfer	Transfers the right of being the LAS to another LM.
9	Reading/writing of NMIB for LM	See Section A5.5.
10	Round Trip Delay Reply (RR) Reply to DLPDU	Not yet supported in the current version.
11	Long address	Not yet supported in the current version.

A5.5 LM Parameters

A5.5.1 LM Parameter List

The tables below show LM parameters of a YTA transmitter.

Meanings of **Access** column entries: RW = read/write possible; R = read only

Index (SM)	Parameter Name	Sub-parameter Name (Sub Index)	Default Factory Setting	Access	Remarks
362	DLME_LINK_MASTER_CAPABILITIES_VARIABLE		0x04	RW	
363	DLME_LINK_ MASTER_INFO_ RECORD	0		RW	
		1 MaxSchedulingOverhead	0		
		2 DefMinTokenDelegTime	100		
		3 DefTokenHoldTime	300		
		4 TargetTokenRotTime	4096		
		5 LinkMaintTokHoldTime	400		
		6 TimeDistributionPeriod	5000		
		7 MaximumInactivityToClaimLasDelay	8		
		8 LasDatabaseStatusSpduDistributionPeriod	6000		
364	PRIMARY_LINK_MASTER_FLAG_VARIABLE		—	RW	LAS: True = 0xFF; non-LAS: False = 0x00
365	LIVE_LIST_STATUS_ARRAY_VARIABLE		—	R	
366	MAX_TOKEN_ HOLD_TIME_ ARRAY	0	0x0000×16, 0x012c×16	RW	
		1 Element1	0x012c×5, 0x0000×27		
		2 Element2	0x0000×32		
		3 Element3	0x0000×32		
		4 Element4	0x0000×32		
		5 Element5	0x0000×32		
		6 Element6	0x0000×31 0x012c		
		7 Element7	0x012c×32		
		8 Element8	0x02		
367	BOOT_OPERAT_FUNCTIONAL_CLASS		Specified at the time of order	RW	0x01 (basic device); 0x02 (LM)
368	CURRENT_ LINK_SETTING_ RECORD	0		R	Settings for LAS
		1 SlotTime			
		2 PerDlpduPhlOverhead			
		3 MaxResponseDelay			
		4 FirstUnpolledNodeId			
		5 ThisLink			
		6 MinInterPduDelay			
		7 NumConseeUnpolledNodeId			
		8 PreambleExtension			
		9 PostTransGapExtension			
		10 MaxInterChanSignalSkew			
		11 TimeSyncClass			
369	CONFIGURED_ LINK_ SETTING_ RECORD	0		RW	
		1 SlotTime	4095		
		2 PerDlpduPhlOverhead	4		
		3 MaxResponseDelay	5		
		4 FirstUnpolledNodeId	37		
		5 ThisLink	0		
		6 MinInterPduDelay	12		
		7 NumConseeUnpolledNodeId	186		
		8 PreambleExtension	2		
		9 PostTransGapExtension	1		
		10 MaxInterChanSignalSkew	0		
		11 TimeSyncClass	4		

Index (SM)	Parameter Name	Sub-parameter Name (Sub Index)	Default Factory Setting	Access	Remarks
370	PLME_BASIC_ CHARACTERISTICS	0		R	
		1 ChannelStatisticsSupported	0x00		
		2 MediumAndDataRatesSupported	0x4900000000000000		
		3 IecVersion	1 (0x1)		
		4 NumOfChannels	1 (0x1)		
		5 PowerMode	0 (0x0)		
371	CHANNEL_ STATES	0		R	
		1 channel-1	0 (0x0)		
		2 channel-2	128 (0x80)		
		3 channel-3	128 (0x80)		
		4 channel-4	128 (0x80)		
		5 channel-5	128 (0x80)		
		6 channel-6	128 (0x80)		
		7 channel-7	128 (0x80)		
		8 channel-8	128 (0x80)		
372	PLME_BASIC_ INFO	0		R	
		1 InterfaceMode	0 (0x0)		
		2 LoopBackMode	0 (0x0)		
		3 XmitEnabled	1 (0x1)		
		4 RcvEnabled	1 (0x1)		
		5 PreferredReceiveChannel	1 (0x1)		
		6 MediaTypeSelected	73 (0x49)		
		7 ReceiveSelect	1 (0x1)		
373	LINK_SCHEDULE_ACTIVATION_VARIABLE			RW	
374	LINK_ SCHEDULE_LIST_ CHARACTERISTICS_ RECORD	0		R	
		1 NumOfSchedules	0		
		2 NumOfSubSchedulesPerSchedule	1		
		3 ActiveScheduleVersion	0		
		4 ActiveSheduleOdIndex	0		
		5 ActiveScheduleStartingTime	0		
375	DLME_ SCHEDULE_ DESCRIPTOR.1	0		R	
		1 Version	0		
		2 MacrocycleDuration	0		
		3 TimeResolution	0		
376	DLME_ SCHEDULE_ DESCRIPTOR.2	0		R	
		1 Version	0		
		2 MacrocycleDuration	0		
		3 TimeResolution	0		
377	DOMAIN.1				Read/write impossible. Get-OD possible.
378	DOMAIN.2				Read/write impossible. Get-OD possible.

A5.5.2 Descriptions for LM Parameters

The following describes LM parameters of a YTA transmitter.

IMPORTANT

Do not turn off the power to the YTA immediately after setting. When the parameters are saved to the EEPROM, the redundant processing is executed for the improvement of reliability. If the power is turned off within 60 seconds after setting is made, the modified parameters are not saved and the settings may return to the original value.

Do not turn off the power to the YTA for 6 seconds after making a change to its parameter settings.

(1) DlmeLinkMasterCapabilitiesVariable

Bit Position	Meaning	Description	Value
B3: 0x04	LAS Schedule in Non-volatile Memory	Whether the LAS schedule can (=1) or cannot (=0) be saved to the non-volatile memory	1
B2: 0x02	Last Values Record Supported	Whether to support (=1) or not to support (=0) LastValuesRecord.	0
B1: 0x01	Link Master Statistics Record Supported	Whether to support (=1) or not to support (=0) DlmeLinkMasterStatisticsRecord.	0

(2) DlmeLinkMasterInfoRecord

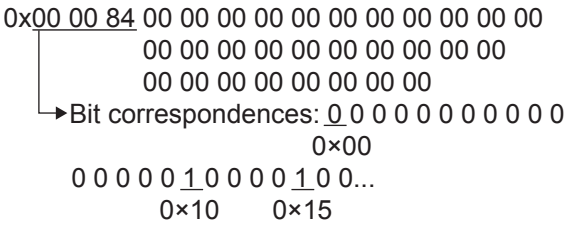
Sub-index	Element	Size [bytes]	Descrip-tion
1	MaxSchedulingOverhead	1	V(MSO)
2	DefMinTokenDelegTime	2	V(DMDT)
3	DefTokenHoldTime	2	V(DTHT)
4	TargetTokenRotTime	2	V(TTRT)
5	LinkMaintTokHoldTime	2	V(LTHT)
6	TimeDistributionPeriod	4	V(TDP)
7	MaximumInactivityToClaimLasDelay	2	V(MICD)
8	LasDatabaseStatusSpduDistributionPeriod	2	V(LDDP)

(3) PrimaryLinkMasterFlagVariable

Explicitly declares the LAS. Writing “true” (0xFF) to this parameter in a device causes that device to attempt to become the LAS. However, a request of writing “true” to this parameter in a device is rejected if the value of the same parameter in any other device that has a smaller node address within the same segment is true.

(4) LiveListStatusArrayVariable

A 32-byte variable, in which each bit represents the status of whether a device on the same segment is live or not. The leading bit corresponds to the device address 0x00, and final bit to 0xFF. The value of LiveListStatusArrayVariable in the case where devices having the addresses 0x10 and 0x15 in the fieldbus segment is shown below.



(5) MaxTokenHoldTimeArray

An 8(64 byte array variable, in which each set of 2 bytes represents the delegation time (set as an octet time) assigned to a device. The delegation time denotes a time period that is given to a device by means of a PT message sent from the LAS within each token circulation cycle.

The leading 2 bytes correspond to the device address 0x00, and the final 2 bytes to the device address 0xFF. Specify the subindex to access this parameter.

(6) BootOperatFunctionalClass

Writing 1 to this parameter in a device and restarting the device causes the device to start as a basic device. On the contrary, writing 2 to this parameter and restarting the device causes the device to start as an LM.

(7) CurrentLinkSettingRecord and ConfiguredLinkSettingsRecord

CurrentLinkSettingRecord indicates the bus parameter settings currently used. ConfiguredLinkSettingsRecord indicates the bus parameter settings to be used when the device becomes the LAS. Thus, when a device is the LAS, its CurrentLinkSettingRecord and ConfiguredLinkSettingsRecord have the same values.

Sub-index	Element	Size [bytes]	Descrip-tion
1	SlotTime	2	V(ST)
2	PerDlpduPhlOverhead	1	V(PhLO)
3	MaxResponseDelay	1	V(MRD)
4	FirstUnpolledNodeId	1	V(FUN)
5	ThisLink	2	V(TL)
6	MinInterPduDelay	1	V(MID)
7	NumConsecUnpolledNodeId	1	V(NUN)
8	PreambleExtension	1	V(PhPE)
9	PostTransGapExtension	1	V(PhGE)
10	MaxInterChanSignalSkew	1	V(PhIS)
11	TimeSyncClass	1	V(TSC)

(8) DlmeBasicInfo

Sub-index	Element	Size [bytes]	Description
1	SlotTime	2	Indicates the capability value for V(ST) of the device.
2	PerDlpduPhlOverhead	1	V(PhLO)
3	MaxResponseDelay	1	Indicates the capability value for V(MRD) of the device.
4	ThisNode	1	V(TN), node address
5	ThisLink	2	V(TL), link-id
6	MinInterPduDelay	1	Indicates the capability value for V(MID) of the device.
7	TimeSyncClass	1	Indicates the capability value for V(TSC) of the device.
8	PreambleExtension	1	V(PhPE)
9	PostTransGapExtension	1	V(PhGE)
10	MaxInterChanSignalSkew	1	V(PhIS)

(9) PlmeBasicCharacteristics

Sub-index	Element	Size [bytes]	Value	Description
1	Channel Statistics Supported	1	0	Statistics data are not supported.
2	Medium AndData Rates Supported	8	0x49 00 00 00 00 00 00 00	Wire medium, voltage mode, and 31.25 kbps are supported.
3	IceVersion	2	0x0403	IEC 4.3 is supported.
4	NumOf Channels	1	1	
5	Power Mode	1	0	0: Bus-powered; 1: Self-powered

(10) ChannelStates

Sub-index	Element	Size [bytes]	Value	Description
1	Channel 1	1	0x00	In Use, No Bad since last read, No Silent since last read, No Jabber since last read, Tx Good, Rx Good
2	Channel 2	1	0x80	Unused
3	Channel 3	1	0x80	Unused
4	Channel 4	1	0x80	Unused
5	Channel 5	1	0x80	Unused
6	Channel 6	1	0x80	Unused
7	Channel 7	1	0x80	Unused
8	Channel 8	1	0x80	Unused

(11) PlmeBasicInfo

Sub-index	Element	Size [bytes]	Value	Description
1	InterfaceMode	1	0	0: Half duplex; 1: Full duplex
2	LoopBackMode	1	0	0: Disabled; 1: MAU; 2: MDS
3	XmitEnabled	1	0x01	Channel 1 is enabled.
4	RcvEnebled	1	0x01	Channel 1 is enabled.
5	PreferredReceive Channel	1	0x01	Channel 1 is used for reception.
6	MediaType Selected	1	0x49	Wire medium, voltage mode, and 31.25 kbps are selected.
7	ReceiveSelect	1	0x01	Channel 1 is used for reception.

(12) LinkScheduleActivationVariable

Writing the version number of an LAS schedule, which has already been downloaded to the domain, to this parameter causes the corresponding schedule to be executed. On the other hand, writing 0 to this parameter stops execution of the active schedule.

(13) LinkScheduleListCharacteristicsRecord

Sub-index	Element	Size [bytes]	Description
1	NumOf Schedules	1	Indicates the total number of LAS schedules that have been downloaded to the domain.
2	NumOfSub SchedulesPer Schedule	1	Indicates the maximum number of sub-schedules an LAS schedule can contain. (This is fixed to 1 in the Yokogawa communication stacks.)
3	ActiveSchedule Version	2	Indicates the version number of the schedule currently executed.
4	ActiveSchedule OdIndex	2	Indicates the index number of the domain that stores the schedule currently executed.
5	ActiveSchedule StaringTime	6	Indicates the time when the current schedule began being executed.

(14) DlmeScheduleDescriptor

This parameter exists for the same number as the total number of domains, and each describes the LAS schedule downloaded to the corresponding domain. For the domain to which a schedule has not yet been downloaded, the values in this parameter are all zeros.

Sub-index	Element	Size [bytes]	Description
1	Version	2	Indicates the version number of the LAS schedule downloaded to the corresponding domain.
2	Macrocycle Duration	4	Indicates the macro cycle of the LAS schedule downloaded to the corresponding domain.
3	TimeResolution	2	Indicates the time resolution that is required to execute the LAS schedule downloaded to the corresponding domain.

(15) Domain

Read/write: impossible; get-OD: possible

Carrying out the GenericDomainDownload command from a host writes an LAS schedule to Domain.

A5.6 FAQs

Q1. When the LAS stops, a YTA does not back it up by becoming the LAS. Why?

A1-1. Is that YTA running as an LM? Check that the value of BootOperatFunctionalClass (index 367) is 2 (indicating that it is an LM).

A1-2. Check the values of V(ST) and V(TN) in all LMs on the segment and confirm that the following condition is met:

YTA		Other LMs
V(ST)×V(TN)	<	V(ST)×V(TN)

Q2. How can I make a YTA become the LAS?

A2-1. Check that the version numbers of the active schedules in the current LAS and the YTA are the same by reading:
LinkScheduleListCharacteristicsRecord (index 374 for a YTA)
- ActiveScheduleVersion (subindex 3)

A2-2. Make the YTA declare itself as and become the LAS by writing:
- 0x00 (false) to PrimaryLinkMasterFlagVariable in the current LAS; and
- 0xFF (true) to PrimaryLinkMasterFlagVariable (index 364) in the YTA.

Q3. On a segment where a YTA works as the LAS, another device cannot be connected. How come?

A3-1. Check the following bus parameters that indicate the bus parameter as being the LAS for the YTA and the capabilities of being the LAS for the device that cannot be connected:
- V(ST), V(MID), V(MRD) of YTA: ConfiguredLinkSettingsRecord (index 369)
- V(ST), V(MID), V(MRD) of problematic device: DlmeBasicInfo

Then, confirm that the following conditions are met:

YTA		Problematic Device
V(ST)	>	V(ST)
V(MID)	>	V(MID)
V(MRD)	>	V(MRD)

A3-2. Check the node address of the problematic device is not included in the V(FUN)+V(NUN) of the YTA.

Q4. "-----" are shown on the LCD of YTA.

Followings are possible causes; No LAS existing on the network, no communication being established between YTA and LAS, or AI Block not being correctly scheduled

A4-1. Check that LAS is correctly connected to the network.
(If YTA is used as LAS, follow the procedures shown in A5.3 (1), (2) and (3))

A4-2. Check that LAS parameters are set so as to meet the YTA's requirement.
(See also 5.2 Network Configuration)

LAS		YTA	
V(ST)	>	V(ST)	(4 or greater)
V(MID)	>	V(MID)	(4 or greater)
V(MRD)	>	V(MRD)	(3 or greater)

A4-3. Check that the node address of YTA is correctly set. (See also 5.2 Network Configuration)
The address should be set as follows.
- Not in the range between V(FUN) and V(FUN)+V(NUM) of LAS.
- Not in the range of default address.

A4-4. Check that the AI block defined in the DISPLAY_AI_OUT of the transducer block is correctly scheduled.

Revision Information

- Title : YTA series
  Temperature Transmitter Fieldbus Communication
- Manual No. : IM 01C50T02-01E

Edition	Date	Page	Revised Item
1st	Oct. 2000	—	New Publication
2nd	Apr. 2001	5-6 7-1 7-5 7-7 8-2 9-1 A-1 A-2 A-10 A-20, 21 A-22 A-26 A-36	Table 5.8 Change the contents of “Description”. Table 7.1 Add an item. Delete AL052 Delete AL162, 163, 164, 172, 173, 174, 180, and 195. Add B) CENELEC (KEMA) Intrinsically Safe Type. Add /KS15 Add explanation for item 16. Correct Explanation for item 18 and 19. Add value for item 38. Add item 116. Correct default for item 23, 24, and 46. A4.4.1 and A4.5.1 Modify explanation. A4.18.1 Add “Local override” in the table. Add Q4.
3rd	Apr. 2003	1-2 8-2 8-5 8-7 9-2	Add “For Safe Use of Product.” Add CENELEC ATEX (KEMA) Flameproof and Intrinsically Safe Type. Add descriptions based on ATEX directive. Add FM Intrinsically safe Type. Add SAA Flameproof Type. Add Option code /KF25, /KS25, /FS15, and /SF1.
4th	Feb. 2005	1-2 1-3 4-2 4-3, 5-2, A-29, 30 8-4 8-6 8-8 9-1 9-2 A-4, 7, 8, 32	Add attention for safe use of product Add ATEX Documentation Correct Address range Correct Web address of DD download site Add CENELEC ATEX Type of Protection “n”. Change Installation Diagram Add Installation Diagram for Nonincendive Add Setting item when shipped Add option KN25 and FF1 and change specification of FS15, LC1, LC2 Change default values of setting
5th	May 2007	5-13 8-1, 2, 4, 5, 8 9-2 8-5 8-10,11	Add Note for BACKUP_RETURN_SENSOR1 Add Standard numbers Change Explanation of production year Add IECEx Certification
6th	Aug. 2007	8-2 9-2	Add Note for ATEX Approval Add Group and Category for ATEX Approval
7th	Nov. 2007	8-2, 9-2 8-9, 9-3	Change Applicable Standards and add Dust Ignition Proof for KF2 Add option SF2
8th	Apr. 2013	8-2 9-2	Change applicable standards. Change ATEX intrinsically safe type Ex ic marking code. Change the notation of the table.